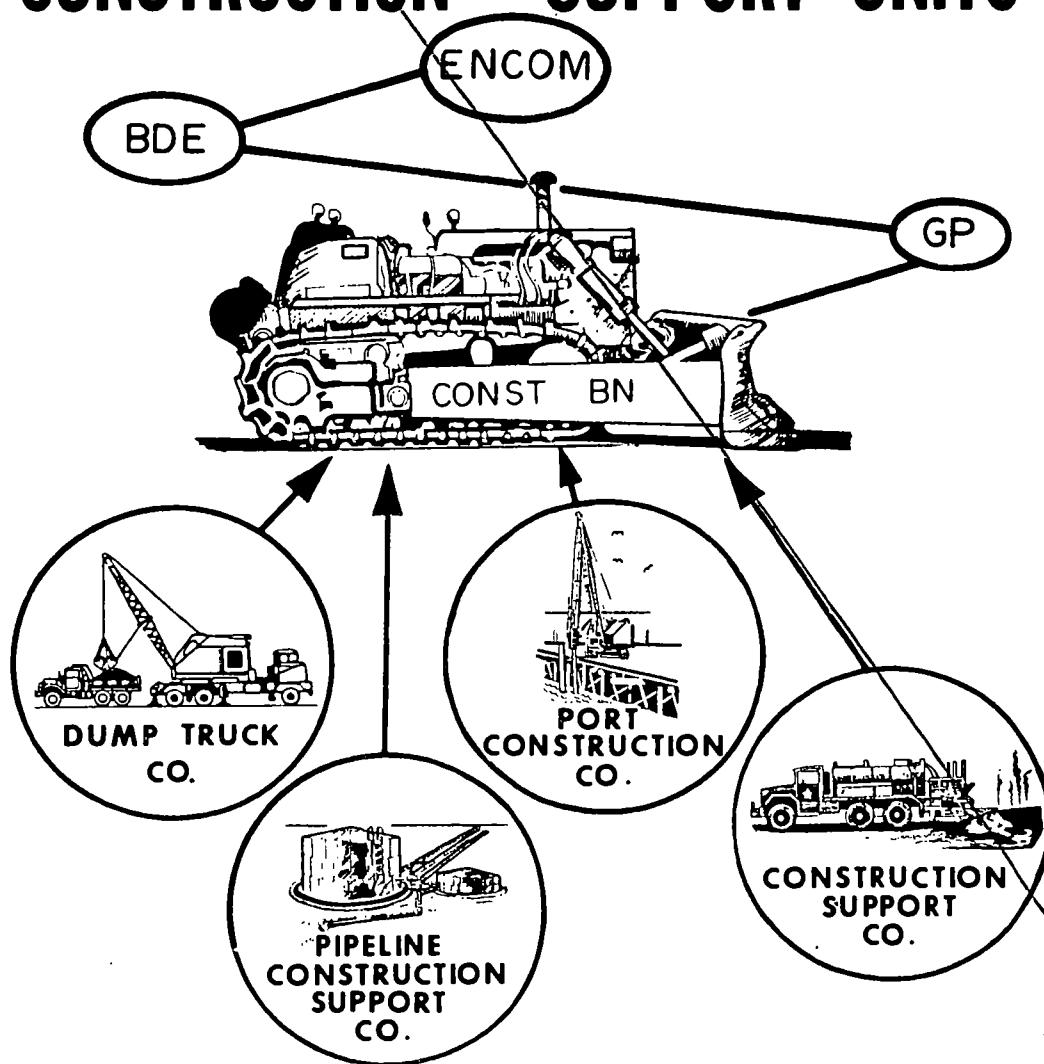


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FM 5-162

FIELD MANUAL

**ENGINEER CONSTRUCTION
AND
CONSTRUCTION - SUPPORT UNITS**



HEADQUARTERS, DEPARTMENT OF THE ARMY

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FIELD MANUAL

No. 5-162

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 30 March 1973

ENGINEER CONSTRUCTION AND CONSTRUCTION-SUPPORT UNITS

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CHAPTER 1

INTRODUCTION

1-1. Purpose

This manual provides guidance for commanders, staff officers, key NCO's and other personnel concerned with the employment of engineer construction and construction support and real property maintenance activities (RPMA) units.

1-2. Scope

a. This manual covers the mission, assignment, organization, major items of equipment, capabilities, and operations of the engineer command, the engineer construction brigade, and the engineer command, the engineer construction brigade construction group, including their attached or assigned construction and construction support and real property maintenance activities (RPMA) units. When used with FM 5-1, which provides basic doctrine governing the activities of engineer troop units in a theater of operations, coverage is in sufficient detail to guide commanders and staffs in the accomplishment of the unit mission. The material contained herein is applicable without modification to both limited or general war, either nuclear or nonnuclear, and to cold war or stability operations.

b. This manual is in consonance with the following International Standardization Agreements which are identified by type of agreement and

number at the beginning of the appropriate section in the manual.

<i>Title</i>	<i>NATO STANAG</i>	<i>CENTO STANAG</i>	<i>SEATO SEASTAG</i>	<i>ABCA SOLOG</i>
Operational Road Movement Orders, Tables and Graphs -----	2041	2041	2041	51
Rear Area Security and Rear Area Damage ---	2079			

1-3. Recommendations for changes

Users of this publication are encouraged to submit recommended changes and comments to improve the publication. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons will be provided for each comment to insure understanding and complete evaluation. Comments should be prepared using DA Form 2028 (Recommended Changes to Publications) and forwarded direct to the Commanding Officer, US Army Combat Developments Command Engineer Agency, Fort Belvoir, Virginia 22060. Originators of proposed changes which would constitute a significant modification of approved Army doctrine may send an information copy, through channels, to the Commanding General, US Army Combat Developments Command, Fort Belvoir, Virginia 22060, to facilitate review and followup.



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CHAPTER 2

CONSTRUCTION IN A THEATER OF OPERATION

Section I. MISSIONS, ROLES, SUPPORT, AND RESPONSIBILITIES

2-1. Mission of the Engineer Construction and Construction Support Units

a. General. The overall mission of engineer construction and construction support units is construction, rehabilitation, and maintenance of routes of communication and all types of facilities required to support combat service operations in the theater of operations and to provide engineer support to the combat elements when appropriate. Additionally, engineer units are capable of constructing railroads and petroleum pipelines. Engineer construction units may also be employed in the combat zone on a task or mission-type assignment to accomplish specialized construction tasks that are not within the capabilities of the nondivisional engineer combat units, for the specific purpose of performing construction tasks of an interzonal construction nature, such as pipeline construction, or providing support to the US Air Force. The normal assignment of engineer construction and construction support units, as reflected in this manual, is applicable to a type theater army and a type field army. However, this does not preclude variations in assignment as the situations and demands for engineer construction support vary.

b. Command Relationships and Support Arrangements.

(1) The theater army commander is responsible for Army construction and provision of RPMA support throughout the theater, including that performed for other US military services and government agencies and for support of allied forces as may be directed by joint, unified, or combined command commanders. The theater army commander normally discharges his construction and RPMA responsibilities through an engineer command (ENCOM) or comparable theater army level command control organization. Depending on availability of engineer resources, the magnitude and diversity of the engineer tasks and the theater army commander's consideration

of span of control, the ENCOM may operate under direct control of the theater army commander or under a theater army support command (TASCOM).

(2) The ENCOM may operate under direct control of the theater army commander and, except for that construction undertaken by or assigned to the engineer combat brigades of field armies or other tactical field commands, the ENCOM is the agent for carrying out theater army construction and RPMA programs. The ENCOM commander accomplishes this mission by supporting theater army subordinate commands with task groupings composed of appropriate engineer troop units and other arrangements for support such as contractual services. This may include accomplishment of construction, RPMA, or combat support tasks within the tactical areas of responsibility of field commands in accordance with priorities established by the theater army commander. Under the foregoing conditions, requirements of the TASCOM will normally be fulfilled through allocation of ENCOM effort and resources to TASCOM activities on a mission, task, or area basis, or a combination of these, with suitable arrangements for command control such as direct support, general support, operational control, or attachment, as may be appropriate.

(3) Alternatively, the theater army commander may assign the ENCOM to a TASCOM and delegate to the TASCOM commander responsibility for accomplishment of the theater army construction and RPMA functions when base development or other support of TASCOM activities is the singular and ruling requirement.

2-2. Role of Construction and Construction Support Units

Engineer construction and construction support units operating in a theater of operations provide engineer combat support and combat service support to the combat elements. Engineer combat

support performed in the communications zone and the combat zone includes construction and maintenance of routes of communication; support of denial operations and barriers; tactical cover operations; construction of rigid petroleum pipelines and field engineering tasks, such as field fortifications and demolitions. By itself, the task of construction and maintaining routes of communication to insure the uninterrupted flow of personnel, supplies, equipment and materials to the combat elements is one of great magnitude. In tasks of this type, execution of the construction mission must be efficient and timely. At times, during the battle, success of the combat element may depend upon the ability of construction and construction support units to complete their construction missions promptly, efficiently, and with a maximum of improvisation. Accordingly, these units must be highly trained in military construction, with the ability to adapt to any operational environment.

2-3. Types of Construction Organizations

a. Command. The volume of military construction in a theater of operations requires numerous engineer construction and construction support units, working in conjunction with other units, teams, and civilian labor. Coordination and supervision of these elements is accomplished by the following engineer command organizations:

(1) *Engineer command.* The engineer command is required to exercise command and control over two or three engineer brigades within a theater army or over three to six engineer construction groups when the situation dictates; a base topographic battalion; facilities engineering districts, groups or teams (RPMA units); and miscellaneous units. Organized under a table of organization and equipment (TOE), this unit is designed to supervise and monitor theater construction. The engineer command is composed of a headquarters and headquarters company and an appropriate number of subordinate units as indicated above. See chapter 3 for details.

(2) *Engineer construction brigade.* The construction brigade is composed of a headquarters and headquarters company to which normally are attached from two to four engineer construction groups and other separate units as required. The construction brigade headquarters is required to command and coordinate the activities of these engineer construction units. See chapter 4 for details.

(3) *Engineer construction group.* The construction group is a command organized similar to the brigade, and has a headquarters and headquarters company to which are normally attached from three to five engineer construction battalions and other construction and construction support units of the number and type required by the group mission. See chapter 5 for details.

b. Engineer Construction Units. Construction units are those units which engage in actual construction operations, independently or in conjunction with each other, and include—

(1) *Engineer construction battalion.* The engineer construction battalion consists of a headquarters and headquarters company, an engineer equipment and maintenance company, and three identical construction companies. It contains varied types of construction equipment and is capable of performing, when supported by attachments of specialized personnel and equipment, all construction commonly required by the Army, Air Force, or other US and Allied forces in a theater of operations. It is capable of independent operation on general construction tasks, although it is usually a part of a construction group. See chapter 6 for a discussion of the engineer construction battalion, and appendix F for the newest proposed revision of the TOE.

(2) *Engineer company, port construction.* The engineer company, port construction, specializes in the type of construction unique to port and inland waterway facilities and POL marine terminal facilities. Chapter 7 covers the port construction company. Appendix G provides data on the tentative TOE for a port construction battalion.

c. Engineer Construction Support Units. Construction support units are those which augment the capabilities of the construction units by supplying specialized equipment and operators.

They include:

(1) *Engineer construction support company.* The engineer construction support company is a separate company which maintains, transports, and operates heavy construction equipment in support of construction battalions and other construction units. See chapter 8 for a discussion of the construction support company, and appendix F for the latest proposed revision of the TOE.

(2) *Engineer pipeline construction support company.* The engineer pipeline construction support company is a separate company which maintains, transports, and operates pipeline construc-

tion equipment in support of construction units engaged in the construction of pipelines and related facilities. See chapter 9 for details.

(3) *Engineer dump truck company.* The engineer dump truck company is a separate company which maintains and operates dump trucks in support of construction battalions or other engineer units (chap 10).

d. *Teams of the Engineer Service Organization.* Any number and type of teams from the engineer service organization (TOE 5-500-series) such as facilities engineering, dredging, diving, and other teams, may be attached to construction and construction support units to provide increased capabilities. See FM 5-1 for a complete listing of the TOE 5-500-series teams, their composition, capabilities, and typical employment.

e. *Engineer Land Clearing Company.* Land clearing operations in heavily forested or jungle areas will require support of the specialized engineer land clearing company (TOE 5-87T). For operational details, see FM 5-142, TM 5-330, DA Pam 525-6, and TM 5-331A.

f. *Real Property Maintenance Activities (RPMA) Units.* Facilities maintenance, management and operation of related utilities is a task requiring special skills and expertise. RPMA units (engineer district, group, and FAST CREST teams) are envisioned as being capable of providing this type of support to facilities users, thus releasing engineer construction and construction support units for more critical missions. For a discussion of RPMA units and concepts, see paragraph 2-9 and appendix C.

2-4. Tables of Organization and Equipment (TOE)

a. *Level 1, Level 2, and Level 3.* Construction units completely staffed by US military personnel normally are organized under the level 1, level 2, or level 3 columns of the applicable TOE. The personnel and equipment allowances under level 1 provide the unit full capabilities for execution of the stated mission during prolonged periods of combat. The columns under levels 2 and 3 adapt the TOE to the lesser requirements for personnel and equipment—approximately 90 percent at level 2 and 80 percent at level 3—during prolonged noncombat periods and limited periods of combat.

b. *Type B Units.* Engineer construction units organized under column K of a TOE are known as type B units. These units consist of the minimum US military personnel necessary for command,

supervision, administration, technical assistance, and specialized maintenance, augmented with non-US personnel. These non-US personnel may be either indigenous personnel or third country nationals. Such units are normally organized and employed in rear areas only. Use of indigenous personnel can contribute substantially to the unit's construction effort. It is highly desirable that the same personnel be employed daily, to facilitate development of a trained and coordinated crew. Civil affairs units or staffs may provide information regarding the quantity and availability of trained and knowledgeable civilian labor and recommend appropriate policies for employment and payment of civilian labor to preclude strained relations, distrust, and unfavorable competition with the local economy. Headquarters and headquarters companies of engineer commands, brigades, and groups are not adaptable to a type B organization, because they consist largely of command and supervisory personnel.

2-5. Types of Support, Assignment, Attachment, and Control of Units

a. *Direct Support.* Direct support is support provided directly to a specific unit. The direct support engineer unit is responsive to the requests of the supported unit, but is not under its command or operational control. Direct support is characterized by close liaison and coordination between the supporting and supported units, and assures that priority of engineer effort is applied as needed to the requirements of the supported command without fragmenting or diluting command control of the engineer support unit by its parent organization. The supporting engineer unit honors all requests from the supported command that are within its capabilities. The parent organization of the supporting engineer element remains responsible for command control and administrative support of subordinate elements deployed in direct support roles. The support of a direct support unit cannot be withdrawn or diverted without the authority of the supported commander or the commander over both the supported unit commander and the commander of the parent engineer organization. Except in special situations where centralized control of engineer effort is infeasible, direct support is the normal method of providing engineer support to units that have no organic engineer capability or to units whose organic engineer capability requires augmentation. As an example, a corps commander may augment the engineer capability of a division by placing a

corps engineer group or battalion in direct support of the division.

b. General Support. General support is that support which is given to the supported force as a whole and not to any particular subdivision. General support is normally employed where centralized control is practical and essential, and the engineer tasks involve coordinated support of two or more subordinate commands. General support may include provisions for priority of effort to be furnished a subordinate command or instructions for the reinforcement of the efforts of the engineers of subordinate commands. For example, army engineer combat units in general support may be required to give priority to rehabilitation and maintenance of roads, bridging, and area preparations needed to facilitate displacement of army artillery or elements of the field army support command (FASCOM) and ENCOM construction units operating in the combat zone may be required to give priority to selected field army tasks. Similarly, corps and army engineer combat units may reinforce the efforts of lower echelon engineers by providing equipment support and production and delivery of construction materials.

c. Assignment. The command under which a unit normally functions is said to be its assigned command. Engineer construction units in a theater of operations may be assigned to theater army headquarters, the ENCOM, or the theater army support command (TASCOM), a field army, and independent corps, or a division. In addition to such initial assignment there may be further assignment. A unit assigned to field army may be further assigned to an engineer brigade under army. An engineer unit may be assigned or attached to a unit other than a higher engineer troop organization. In such instance, the unit reports to the commander of the organization to which it is assigned or attached. Normally, engineer units so attached or assigned to a nonengineer command or activity are placed under the operational control of the command or activity engineer.

d. Attachment. When a unit is temporarily under a command other than the assigned command, it is said to be attached. The unit may be attached for some explicit purpose, such as to receive rations, supply, or administration. However, unless the purpose is specified, attachment implies that the command to which the unit is attached has full responsibility for the employment and support of the unit including its supply, adminis-

tration, training, and utilization. Responsibility in matters relating to the transfer and promotion of personnel is retained by the parent unit. Although it has certain disadvantages, attachments may be necessary when it is impractical for the parent unit commander or senior engineer command to exercise effective control, support, and supervision. During periods of attachment it is mandatory that appropriate liaison, exchange of information, and organizational, technical, and logistical support be maintained between the engineer unit and the command to which it is attached.

e. Organic Units. Organic units are units assigned by TOE to a military organization and forming an essential part of it. The organic elements of a unit are those listed in the unit table of organization. For example, TOE 5-115 lists the TOE of the units organic to the engineer construction battalion—TOE 5-116, Headquarters and Headquarters Company; TOE 5-117 Engineer Equipment and Maintenance Company; and TOE 5-118, Engineer Construction Company.

f. Operational Control. Units under operational control are placed under a commander for assignment of tasks and authoritative direction necessary to accomplish the mission. Operational control does not include responsibility or authority for combat service support, administration, internal organization, or unit training.

g. Technical Control. Units receiving technical control from a higher echelon are afforded the specialized or professional guidance and direction exercised by an authority in technical matters. Technical control does not imply a command relationship. However, under this type of control, ENCOM can require RPMA units to abide by established maintenance of facilities standards, base development limitations, and real estate acquisition requirements.

h. Indigenous Labor Support. Engineer units at all levels of command can augment their organizations with indigenous personnel in peacetime and during hostilities. The way an organization is augmented determines how well the using unit accomplishes its mission. The ability of a unit to function as a type B unit, for example presupposes that the US personnel in it are trained to administer, supervise, and employ indigenous personnel (chap 13). Full-strength TOE engineer units, using qualified US supervisors, can utilize indigenous labor to increase their construction capability or relieve US personnel for more critical unit tasks. Every level of command in the

engineer structure should be aware of the advantages of using indigenous labor, and make every possible effort to employ it expeditiously when the situation permits (para 2-4b).

2-6. Engineer Construction and Combat Support for Independent Corps

A corps usually is a major subordinate command of a field army. When the corps performs such a role or when its assigned mission requires it to operate far removed from the field army, the corps is known as an independent corps (FM 100-15). An independent corps is similar to a theater army in that it may have area responsibilities encompassing base development functions. In the case of an independent corps, combat service support is provided by a corps support command (COSCOM), the engineer combat brigade, and other combat service support units as required. The COSCOM would have as its nucleus a support brigade of a type field army support command. The support brigade's augmentation consists of sufficient theater army support command (TASCOM)-type combat service support elements to enable the corps to conduct independent operations. The engineer combat brigade of the corps is responsible for all engineer activity in the corps area. If the requirements for engineer effort exceed brigade capabilities, engineer construction units and other engineer units will be added. If necessary for command, control, and communications, the augmented brigade will evolve into a modified engineer command tailored to meet the requirements of the corps area. The type of engineer units that may need to be attached to the combat brigade to carry out theater base engineer activities are:

HHC, Engr Const Gp	----	TOE 5-112
Engr Const Bn	-----	TOE 5-115
Engr Topo Bn, Army	----	TOE 5-305
Engr Const Spt Co	-----	TOE 5-114
Engr DPTrk Co	-----	TOE 5-124
Engr Pl Const Spt Co	----	TOE 5-177
Engr Co Port Const	----	TOE 5-129
TM GA, Forestry	-----	TOE 5-520
Fac Engr Gp	-----	RPMA TOE to be developed

2-7. Engineer Construction Support for a Field Army

The actual number and types of engineer units employed in a field army depend upon the same factors as in corps. The majority of these units perform their tasks within the army service area; however, army engineer units normally support corps operations by assuming responsibilities for

engineer tasks forward into the corps area. The nature and extent of this support normally is determined by informal agreement between the corps and army engineers. Engineer units in a type field army may consist of (fig. 2-1)—

- a. One engineer combat brigade headquarters.
- b. Three engineer combat group headquarters.
- c. Twelve engineer combat battalions, army.
- d. Six engineer float bridge companies.
- e. Six engineer panel bridge companies.
- f. Three engineer light equipment companies.
- g. Three engineer dump truck companies.
- h. One engineer topographic battalion (army).
- i. Engineer cellular teams as required.
- j. Facilities engineering district, group, and teams (as required).

2-8. Engineer Support for the Air Force

a. *General Requirements.* Engineers support the Air Force in two areas—mapping and geodetic services, and troop construction. Mapping and geodetic services include the provision of ground control, maps, and related data for weapon systems, as required by the unified command for theater Air Force tactical and strategic planning, training, and operations. Air Force construction requirements vary from new construction to rehabilitation and repair beyond immediate emergency damage recovery, requirements which are within the organic capability of Air Force civil engineers.

b. *Responsibilities.*

(1) The Department of the Army is responsible for providing the required engineer troop support for the Air Force and for organizing and training the units necessary to provide this support. This includes the supply of construction materials and equipment except that required for immediate emergency damage recovery.

(2) The Department of the Air Force is responsible for providing its current and anticipated construction, mapping, and geodetic requirements to the Department of the Army in broad terms that the Army can translate into specific support requirements. It is also responsible for developing and maintaining a capability to provide base maintenance support, including immediate emergency damage recovery, within the organic capability of Air Force civil engineering resources.

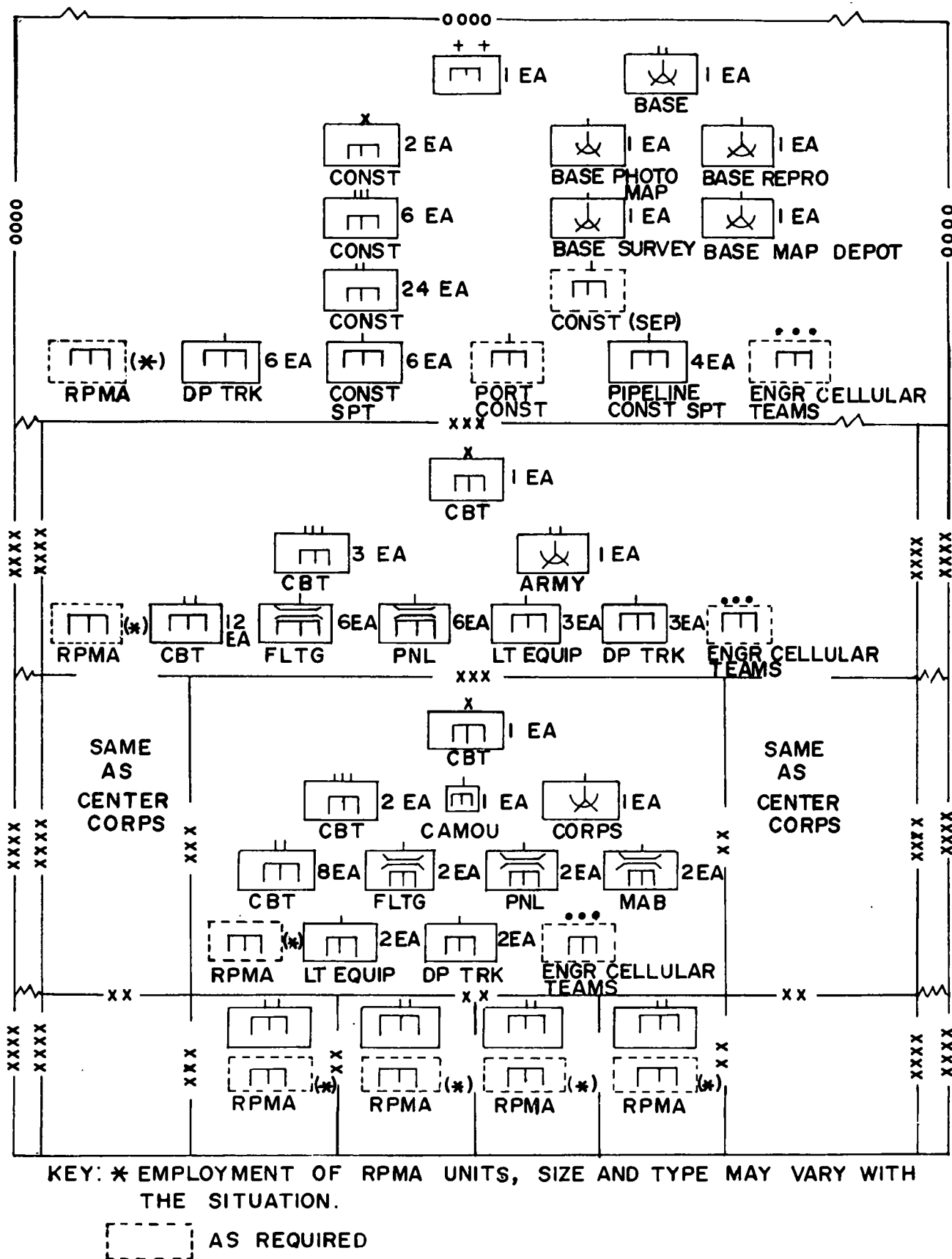


Figure 2-1. Type engineer support for a large landmass field army.

(3) The theater army commander is responsible, within his theater, for providing the theater Air Force with construction, mapping, and geodetic support, in consonance with the limitations described above.

c. Construction Support. Construction support is furnished in response to specific project requirements. If construction support is required in areas containing no Army command, engineer construction units may be attached to another service command. When so attached, these units remain under the control of the senior engineer unit commander unless the Army commander releasing them, or higher Army authority, decides otherwise. The Army commander releasing the unit for the mission determines whether there is a need to augment the unit to insure adequate command and control.

d. New Construction.

(1) *General.* Engineer construction support of Air Force operations involves construction and improvement of rear area heavy- and medium-cargo airfields, rear area and forward area tactical (fighter-bomber) airfields, support area medium-cargo airfields, missile sites, Air Force troop housing, command, administrative and medical facilities, and protective construction.

(2) *Procedures.* Base development responsibility rests with the theater commander. The joint staff prepares the theater base development plan. (See FM 31-82 for base development criteria.) If a director of construction or comparable staff engineer officer position is established on the joint staff he will be the staff officer principally responsible for preparation of the plan. Construction forces of the Service components are assigned construction responsibilities on a task, area, or mission basis. Where the Army component is the predominant one, it may be tasked with the responsibility for preparing the theater base development plan. However, the plan and any changes to it must be approved by the theater commander. Within the context of this policy the theater Air Force commander advises the theater Army commander of the Air Force requirements for construction of airfields and any other facilities and their general location. To facilitate project planning, the appropriate Air Force commander also provides a general siting plan supported by a development plan that includes any special requirements. He furnishes aircraft characteristics, allowance factors, and formulas; broad design, lay-

out, and construction criteria; and policy guidance in the form of definitive drawings, specifications, regulations, manuals, or any other references applicable to theater of operations construction requirements unique to the Air Force. With the receipt of this information, the theater Army commander establishes support policies and assigns or allocates design and planning projects to appropriate subordinate Army commands where they may be further delegated to an engineer command, brigade, or group for implementation. Normally an engineer construction group commander reconnoiters the various proposed sites. Upon approval of the location, the group normally prepares plans and specifications by site adaptation of standard design. After approval of plans and specifications, determination of construction priorities, and receipt of the construction directives, the group commander directs one or more of his attached construction units to do the work. The group tests and inspects the construction for compliance with plans, specifications, and sound construction practices. Appropriate arrangements should be made for coordination and liaison between the constructing organization and the planned Air Force occupant during all phases of planning and execution. This is required to insure that construction criteria and staging meet current requirements and that adjustments in criteria and siting can be accomplished in a timely manner and are in the best interests of the constructing and using units.

(3) *Rehabilitation and repair.* Routine maintenance and repair of Air Force installations are the responsibilities of the Air Force base maintenance forces. However, when an existing airfield or other air facility has deteriorated or is damaged to a point requiring major rehabilitation, the work is assigned to engineer construction units. The engineer construction battalion is the logical unit to receive such assignments since it can rehabilitate airfields in a concentrated area or at numerous dispersed sites. Requirements for airbase rehabilitation support in overseas areas are determined by the theater Air Force commander and transmitted to the theater Army command, where they are processed like requirements for new construction.

(4) *Immediate emergency damage recovery.* Immediate emergency damage recovery of airfields is considered to be the minimum work required to permit aircraft to land and take off. Responsibility for this is assigned to the Air Force.

2-9. Engineer Real Property Maintenance Activities (RPMA) Support

a. General. Real property maintenance activities (RPMA) support in a theater of operations includes tasks that vary greatly with the type of unit(s) supported, the intensity of the conflict, and the environment. This may include repair and maintenance of facilities, operation of utilities systems, provision of firefighting services, real property acquisition and disposal, and other facilities engineering tasks, as required. The capability developed to provide this support must be coordinated and efficiently linked with the total engineer resources available in the theater of operations (TO). It must use modern operating and management systems and adapt readily to changes in the type and degree of support required. The units proposed (the facilities engineering team, group and district) will serve as a basic framework upon which RPMA support for a particular contingency can be formed. For details see appendix C.

b. Engineer Command

(1) *Mission.* The engineer command will provide facilities engineering general and direct support to all elements of the theater army authorized such support, including both the communications and combat zones. Support will normally be provided on an area/major installation/major unit basis. The number of facility engineering districts and groups will be determined by the density and distribution of the army elements authorized this support.

(2) *Functions.* The theater army ENCOM or comparable theater army level engineer command control organization provides centralized direction and control of the theater RPMA operations. The command provides the formal link between contract construction, troop construction and RPMA resources to insure full and coordinated utilization of the total theater engineer resources. It will be capable of managing the activities of one or two facilities engineering groups in a small theater that does not require a facility engineering district. In addition to planning and managing the theater RPMA program, the engineer command will continually analyze the RPMA function to determine the effectiveness of the support provided it will also evaluate possible improvements such as use of new and different management systems, incorporation of new construction techniques and material, development of new RPMA organizations, and tailoring of exist-

ing forces including incorporation of civilian labor and contractors.

c. Management and Planning System. A modern management and planning system using automated equipment is required for effective and efficient control of real property maintenance activities. The various tasks of planning, budgeting, accounting, inventorying, reporting, scheduling, estimating, etc., should make full use of computers and automatic accounting, compilation, and reporting equipment. The system must be accessible to the needs of managers and planners at all levels and interrelate the status of major engineer contract construction operations, RPMA activities, resources and capabilities. Dedicated data processing equipment, or guaranteed access to such equipment, and a complement of the necessary skills in engineer TOEs are needed to efficiently implement and utilize such a system.

d. Supply System. RPMA-associated materiel is characterized by many special-purpose, low-density, and high-cost items that are smothered in a TO supply system. A dedicated data processing system, managed by an RPMA unit and capable of local procurement of critically needed and special-purpose items such as transformers and utility fixtures, would provide a responsive and flexible RPMA supply system. At a minimum, any RPMA supply system must guarantee and efficiently manage the flow of RPMA-associated materiel.

e. Civilian Labor and Contractors. Extensive use of civilian labor and contractors (US and indigenous) is an inherent and essential aspect of RPMA activities. However, the military structure will consist of single units or a mix of RPMA units assigned to the TO as the situation warrants.

f. Command and Control.

(1) Efficient and economical use of RPMA resources dictate flexibility in command control arrangements, centralized direction, and vertical echelonment of RPMA units from theater army level down to each field command with provision for responsive support at each echelon. Setting up the RPMA organization parallel with other military engineering support will permit complete integration and coordinated application of resources which can be adjusted to fulfill requirements ranging from mobile combat operations to static peaceful theaters.

(2) The functional organization of the facilities engineering team, group, and district permits an evolutionary transition from TOE military units needed during mobile combat operations to specifically tailored TDA organizations needed for economical employment in static peaceful theaters. Command and control procedures must be equally flexible. Whenever possible, RPMA support will be provided on a general- or direct-support basis. However, when necessary within the combat zone, required RPMA units will be attached to the combat engineer organization responsible for engineer support to the subordinate commands concerned. General support will normally be employed when centralized control of the RPMA units is practical. In situations where this control is infeasible, direct support will be provided. The direct support RPMA unit will be responsive to and maintain close liaison with the supported unit; however, there will be no change of command. During mobile combat operations when it is impractical for the engineer command to exercise effective control, support, and supervision of RPMA units located in the combat zone, the appropriate RPMA units will be attached to the responsible combat engineer organization. Attachments of RPMA units are terminated as soon as conditions permit command, control, and support of the RPMA element to be exercised by its parent headquarters.

(3) Figure 2-2 illustrates the typical command and control arrangement and manner in which RPMA units are echeloned in a major theater of operations in which tactical areas of re-

sponsibility (TAOR) are relatively static. This arrangement is also applicable to support of an army of occupation and peacetime support of overseas Army component commands. Figure 2-3 illustrates command and control and echelonment under circumstances of highly mobile tactical operations in which the TAOR and field command boundaries are changed frequently as a result of tactical movement.

(4) The following terms are defined in AR 310-25. The definitions listed are amplifications of these definitions for use with RPMA:

(a) *Command*. The authority which a commander exercises over subordinates.

(b) *Technical control*. The specialized or professional control, coordination, guidance and direction exercised by higher authority in technical matters. Routine technical reports, instructions, standards, and procedures not involving variations from command policies and directives are accomplished through normal command channels.

(c) *Attachment*. The placement of units in an organization where such placement is relatively temporary. The engineer organization (the combat engineer brigade or the divisional combat engineer battalion) receiving the attachment will exercise the same degree of command and control over the attached unit as over organic units of the command. However, personnel management (transfer and promotion) and unit structure (modification TOE (MTOE)) matters will remain under the control of the engineer command.

Section II. GENERAL CONSTRUCTION

2-10. Principles Governing Military Construction

a. Construction should be accomplished within the allocated time; utilize a minimum of materials, equipment, and skilled labor; and have as an objective the conservation of natural resources and supplies.

b. Maximum use should be made of installations and facilities described in the Army Facilities Components System and other standard drawings when they are applicable.

c. If new design is necessary, it should be simple and flexible to provide for multipurpose use and future expansion of the completed work.

d. All designing and planning must reflect avail-

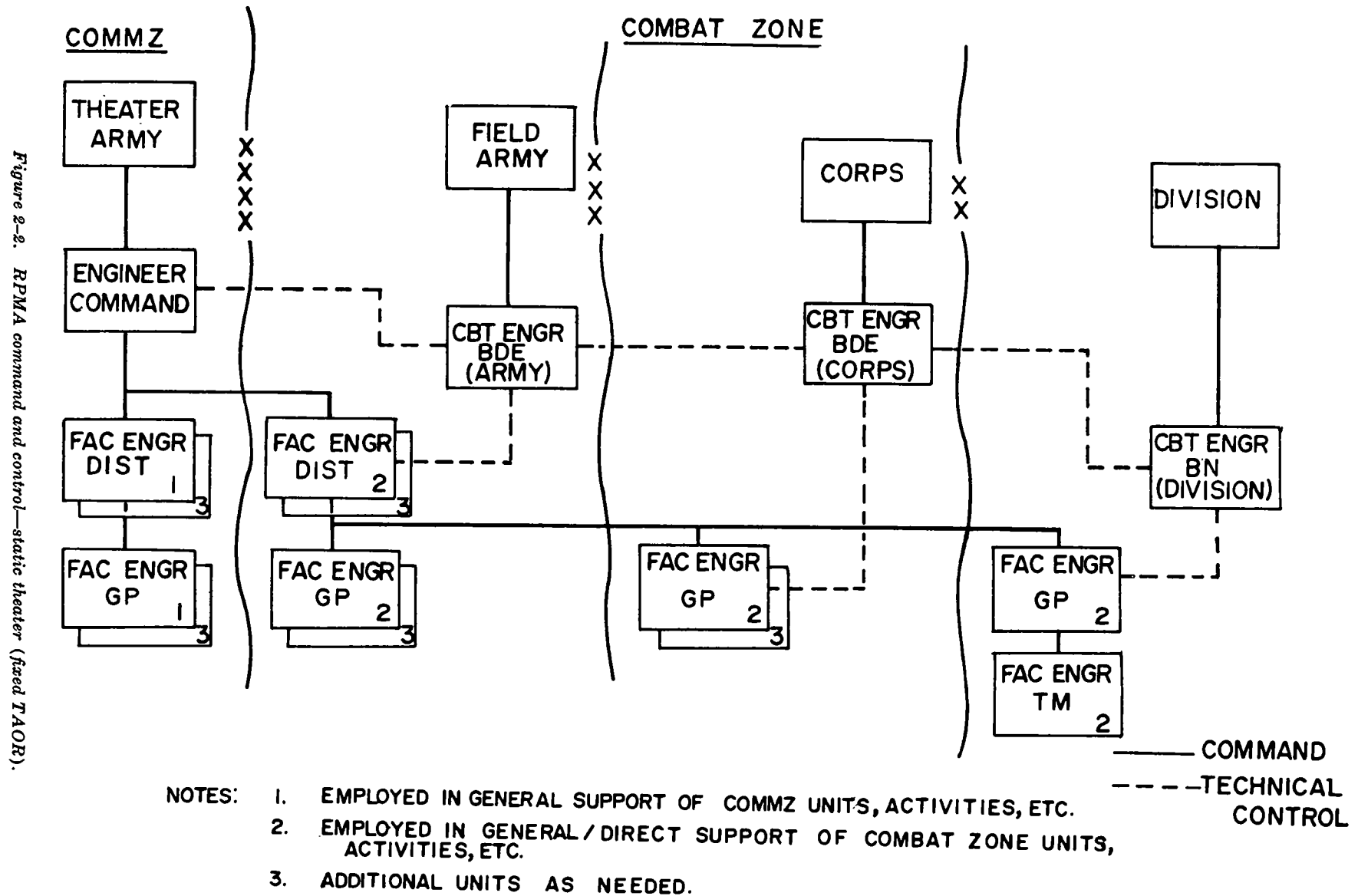
able materials and level of training of construction personnel. When material and equipment must be procured outside the theater, the leadtime requirements must be considered.

e. The construction standards for any structure to be erected must not exceed those established by the theater commander.

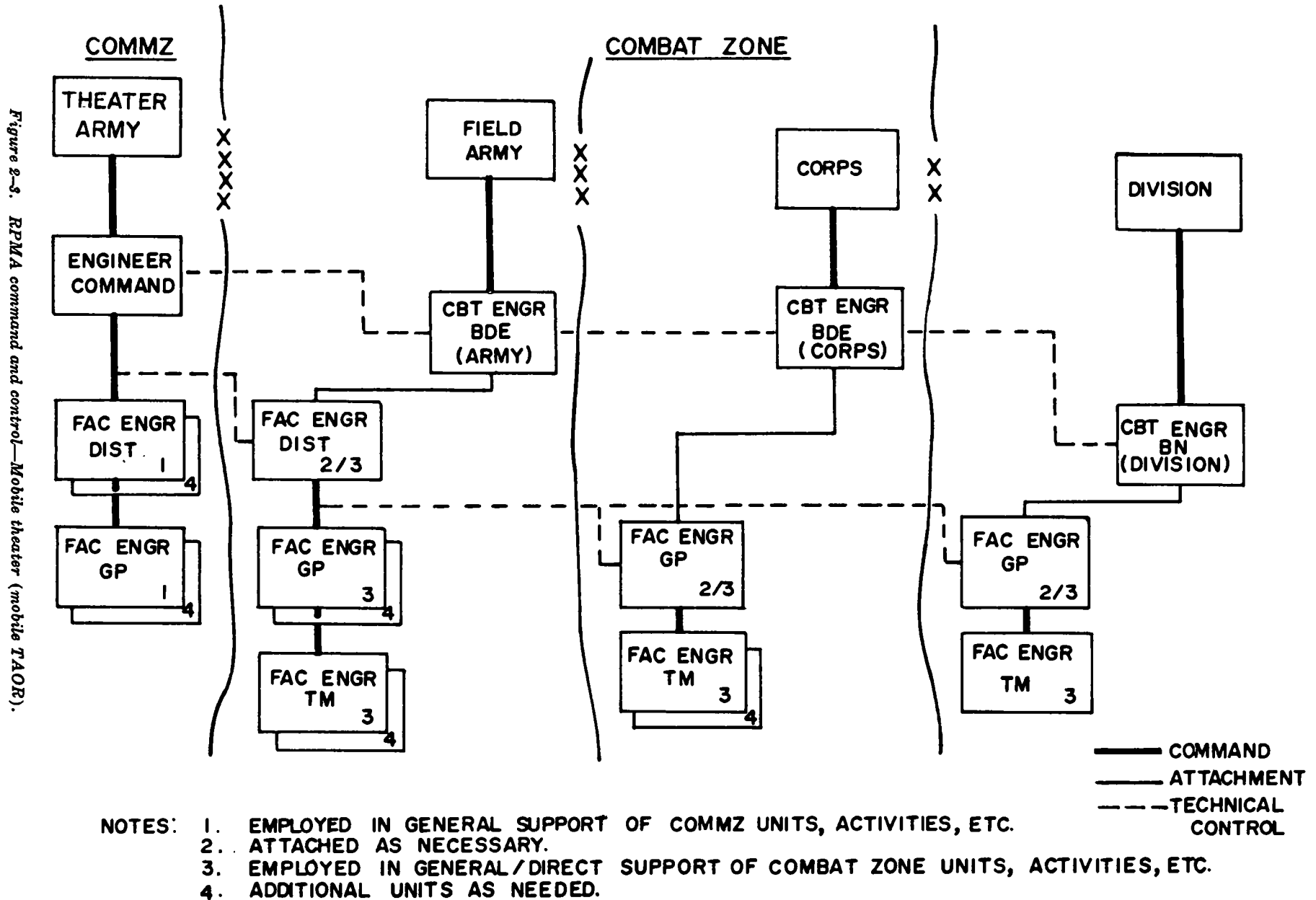
f. Existing facilities must be used before initiating new construction.

g. Only the minimum facilities consistent with military necessity can be provided. In view of the extremely heavy demands on engineer effort and the tonnages involved, economy of construction is most important. Prefabricated structures may be practicable from a timesaving standpoint.

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h. Generally, a large project is completed in units to allow the completed parts to be used while construction continues. However, when time is the most important factor, economy or manpower is secondary and the project is completed in the fastest, most practical manner. Production-line methods may be used in some cases.

i. Underground or protected sites should be considered in the construction of essential facilities. Improvisation may be used whenever possible to reduce material requirements.

j. Facility planning must avoid creating lucrative targets for estimated enemy weapon systems capabilities. Dispersion of installations should be considered at all times, from the viewpoints of probable vulnerability, economy and calculated risk.

k. Vague delineation of a project inevitably leads to confusion and friction. The responsible engineer needs to strive for an explicit understanding with the using agency, and, in particular, should point out borderline features not covered by the project plans.

l. Camouflage should be planned during initial site selection and construction. Early consideration of camouflage requirements, if any, prevents excessive costs, limits destruction of existing terrain, and insures better concealment.

2-11. General Construction

a. General. The maximum scale of installations and facilities to be provided for forces in a given theater is specified by the theater commander on recommendation of the joint staff. These standards are binding on the service component commanders (Army, Navy, Air Force) and are referenced in JCS Publication 3 (app I) and AR 415-16. A guide for such construction standards is found in the Army Facilities Components System (TM 5-301 and TM 5-302.) During initial stages of development of any base, when supply of construction materials is most critical, and at locations to be occupied for only a few weeks or months, the commander charged with the operations is responsible for keeping the scale and standard of construction commensurate with available resources and probable length of time the facilities will be used. Facilities and installations are intended to reach the maximum scale of development indicated in the above referenced manuals only where functional use of the base for more than 2 years is contemplated or where con-

ditions necessitate intermediate or temporary standards of construction. In all cases, construction standards should be held to the minimum necessary to accomplish assigned missions. (For oversea and CONUS standards of construction, see DOD 4270.1-M.)

b. Army Facilities Components System (AFCS). The Army facilities components system provides standards of construction, standard plans, bills of material, equipment augmentations, and general guidelines for the construction effort required for given facilities and installations. This relieves the constructing units of much of the task of preparing drawings, specifications, and bills of material. In addition, the system permits automatic data processing to determine the overall requirements for the engineer support of military operations in any given theater of operations. This includes requisitioning, shipping, and maintaining balanced stocks of material, equipment, and units. The system is developed in TM 5-301, TM 5-302, and TM 5-303. See AR 415-16 for explicit guidance.

(1) *TM 5-301, Staff Tables of AFCS.* This manual explains the concept and use of the system and contains tables of the installations, facilities, and equipages in the system. It is of primary interest to logistics planners but all engineer officers should become familiar with it. Separate coding systems for installations, facilities, items, and equipages are established and explained. This coding permits exploitation of data processing machines and allows for logical expansion and changes in the system. Note that "installation," "facility," "item," and "equipage" have specific meanings when used in the AFCS—meanings different from their usual connotation.

(a) An *item* is any construction material or equipment. Each item has an associated federal stock number (FSN), description, unit of issue, unit shipping weight, unit shipping volume, and unit cost. Examples are: 40d common steel wire nails (FSN 5315-010-4666) or 94-lb bag of portland cement (FSN 5610-250-4676).

(b) A *facility or subfacility* is a group of items designed to provide a service or a basic component part such as a road bridge superstructure, double lane, class 25, for a 20-foot span (facility number 852801) or a fluorescent lighting kit (facility number 814101). Each facility has an associated facility number, description, unit of issue, shipping volume, shipping weight, and cost.

(c) An *equipage* is a list of construction equipment items designed to complement an engi-

neer troop unit's organic equipment or to equip a civilian indigenous work force for specific construction tasks in theaters of operations. Equipages consist primarily of nonexpendable construction equipment. Equipage lists are based on sustained operations for a given task for periods of 2 to 3 months. Each equipage has an associated equipage number, description, unit of issue, shipping volume, shipping weight, and cost. An example might be an equipage augmentation for an engineer construction battalion performing building construction (equipage number E04103).

(d) An *installation* is the highest order of building block in the AFCS. An installation is a group of facilities designed to provide a specific service or support some Army function in theaters of operation. Each installation has an associated installation number, description, unit of issue, shipping volume, shipping weight and cost. Examples of installations are: a 100-bed hospital (installation number G-3.162, or a 3,000-man troop camp (installation number NT-5.142).

(2) *TM 5-302, Construction in the Theater of Operations*. Of the three AFCS manuals, TM 5-302 is the most useful to construction units. It contains site and utility layout drawings; drawings of buildings and other structures; standard and special detail drawings; and simplified bills of material for many of the structures. The first four digits of a facility code number identify the drawing of that facility as presented in TM 5-302.

(3) *TM 5-303, Bills of Material and Equipment of the AFCS*. This manual contains the complete bills of material for each facility and the bill of equipment for each equipage in the AFCS. Construction units may use it as a guide for requisitioning. The facility code number identifies the bills of material for each facility and the equipage code number identifies the bill of equipment for each equipage.

2-12. Specific Construction Tasks

a. Roads.

(1) *General*. Adequate roads are essential to large-scale military operations and their construction and maintenance requires the commitment of a large proportion of the engineer units in a theater. Unless the responsible engineer resorts to all practical means to reduce the workload, and undertakes new construction only when absolutely necessary, too much of his engineer effort can be expended on road construction and maintenance. New construction usually can be limited to those

projects paying large dividends such as port egress highways, bypasses to relieve congestion, and depot roads; and maintenance can be limited to a carefully selected highway net. Much engineer time and effort can be saved if installation commanders are required to do as much of their own interior road work as possible.

(2) Characteristics.

(a) *Quality*. Although the engineering principles involved are unchanged, construction and maintenance of military roads differ from civilian road work in that the time factor, supply problems and enemy action impose a greater range of problems and require modification of construction methods. There is little need in a TO for construction as permanent as that expected in most civilian projects. In forward areas, the urgencies of the military situation usually require rough, hasty work designed primarily to meet immediate needs. In rear areas, there is a limited requirement for slower, more careful construction. However, most engineer road construction and maintenance falls between these two extremes.

(b) *Mission Requirements*. On the basis of tactical or strategic situation, higher authority dictates certain requirements or specifications when assigning a road construction mission. These include—

1. *Time allotted for completion*. In forward areas, speed is usually the dominating factor.

2. *Type of construction*. For example, main supply route, fair-weather road for temporary traffic relief, or other type.

3. *Location*. Specific location should always be determined by a competent, trained engineer. Principal engineering factors for site selection are the probable kind and amount of traffic, existing facilities, future expansion, obstacles, river crossings, tree removal, earthmoving requirements, topography, drainage, soils, availability of materials, and accessibility of the site.

(3) *Special considerations*. The following factors must be considered in all road construction work and are of particular importance in a theater of operations.

(a) *Economy of time*. The nearer the operation is to the front, the more vital the time element becomes. Time is saved by efficient use of manpower, power equipment, handtools, materials, and other available facilities.

(b) *Simplicity.* Simple designs calling for available materials and requiring a minimum of skilled labor should be used.

(c) *Economy of materials.* Materials must be conserved, particularly those shipped from the zone of interior. Local materials should be used whenever practical.

(d) *Location.* The location of new construction projects is normally dictated by military necessity. However, existing facilities should be used whenever possible to avoid unnecessary construction.

(e) *Safety and durability.* Road safety and durability are not as important for military construction as for civilian construction. Safety factors often are materially reduced because of the relatively short time the roads will be used; the inherent risks of war; and the need to save time, materials, and manpower. All military construction in a TO is designed to last for the mission duration.

(f) *Planning and management.* Good planning, careful scheduling, and thorough supervision are essential to speed and economy. When the situation requires, stage construction should be used to permit use of the facility while further construction and improvement continue.

(g) *Terrain.* Slopes, drainage, vegetation, character of soil, likelihood of floods, and other unusual conditions that may affect construction and layout should be studied, preferably by terrain and hydrologic teams. Dense brush timberland, and rolling terrain that may require heavy clearing or grading are normally to be avoided in combat area construction.

(h) *Air Defense measures and camouflage.* Aerial attack on vital installations in proximity to the road site must be expected. The likelihood and effectiveness of such attacks, however, are often lessened by the selection of a site that gives protective concealment and by the use of antiaircraft weapons and camouflage.

(i) *Protection of existing facilities.* In all construction, whether in forward or rear areas, care must be taken to prevent destruction of or damage to existing facilities. Unnecessary damage to existing facilities, whether above or below the surface, will require repairs and an expenditure of time and manpower far exceeding that required to prevent such damage or destruction.

(4) *Reconnaissance.* When roads are needed in a theater of operations, it is almost axiomatic that these facilities must be ready for use as early

as possible because the need is usually critical. Good reconnaissance is the best time saver. This does not imply that exhaustive field investigations or elaborate plans are necessary. However, adequate investigations of the site and careful study of the design details are essential for maximum economy in construction time and effort. In the preliminary reconnaissance it is possible that a few hours spent in soil investigation will save days in construction time. Finding a gravel pit easy to work and near at hand, or locating a rock ledge which might impede grading operations are examples of helpful reconnaissance. The comparison of soil conditions on two possible sites requires extra effort, but may mean the difference between simple and difficult work. After site information is collected and the type of construction is determined, such details as establishing grade lines, location of work areas for different equipment, sequence of operations, procedure for compaction, and the thickness of base and surface courses must be considered in relation to all possible solutions in order to select the proper one.

(5) *Highway preventive maintenance measures.*

(a) A command-wide indoctrination program stressing preventive maintenance of highways will reduce unnecessary damage resulting from careless driving practices. The command concerned should publish a comprehensive snow and ice control plan that clearly specifies the responsibilities of both engineer and nonengineer units. It is important that the available snow and ice control equipment and supplies be allocated to support the plan.

(b) Snow and ice problems in a temperate climate are best solved by summer and fall procurement and reconditioning of snowplows, distribution of cinders, sand, fine aggregate and salt, and similar preparations.

(c) The importance of drainage to road maintenance must be emphasized in engineer troop training. Culverts and ditches are inspected for obstructions, and cleared of any accumulated debris.

(6) For details on road construction, including reconnaissance, design, and maintenance, see TM 5-330/AFM 86-3.

b. *Bridges.*

(1) *Responsibilities.* Engineers are responsible for the construction, rehabilitation, and repair of all highway and railway bridges in a theater of operations (TO) and for all maintenance except

routine maintenance of railway bridges, which is within the capability of the transportation railway operating battalion.

(2) *Special considerations.*

(a) *Economy of time and materials.* Of time and materials, time is normally the more critical in war and its economy is possibly the paramount consideration in the construction of military bridges. On the other hand, there is always shortage of construction materials in war. Using scarce materials too freely to save time in one locality or on one occasion may result in the failure of a military operation in another locality at a later date. A balance of these two economies must be achieved by weighing all factors.

(b) *Mission.* The mission of a bridge is the most important factor in determining the type of bridge to be constructed.

(c) *Permanency.* The length of time the bridge is intended to be used should be considered.

1. Temporary bridges are usually constructed in forward areas to open routes of supply for the assault troops or to provide access to certain areas for a limited time. They are hastily constructed, and replaced as soon as possible or abandoned altogether. These structures are designed for a short life, normally not over 6 months. If possible, provision should be made for easy replacement. Temporary bridges may be either prefabricated or field-designed. The prefabricated temporary bridges are designed to carry a given load and require a short time to construct. Their expense is justified by the decrease in erection time; however, they should be replaced as soon as possible to enable the reuse of the prefabricated materials in the more forward combat area. The field-designed temporary bridge most often used is the simple stringer span, timber trestle bridge. Logs or local materials are used when available. Erection time is usually longer than for prefabricated bridges, but the logistic problems are greatly reduced. Simplicity and standardization of construction aid in rapid erection with a minimum amount of equipment and skilled labor.

2. Semipermanent bridges normally are used to replace temporary structures and are intended to last for the duration of hostilities. The most common semipermanent structure is a timber or steel stringer span with either timber trestles or pile-type supports. Time is not as critical in the construction of a semipermanent bridge as it is with a temporary bridge and the material and construction effort normally have a greater

influence. The location becomes important. Semipermanent bridges are tied in with existing road nets wherever possible to avoid detouring vehicles excessively to permit a shorter bridge crossing. These bridges are required to carry heavier loads and may be constructed by noncombat troops or civilian labor. With two exceptions—their less permanent nature, and the lack of consideration given to their appearance—these bridges are built in accordance with the recognized principles of civilian bridge construction.

3. Permanent bridges are sometimes built in the rear areas along main routes. Very special circumstances may justify the decision to use this type of construction. When that is so, the equipment and materials available and the skill of the personnel are more important considerations than the time element.

4. *Materials.* Prefabricated fixed and floating bridge components and the standard family of beams and girders are used for tactical bridging. Depot stocks are conserved by the use of portions of existing bridges left in place and beams, timbers, and bracing from cannibalized buildings. Strategically important materials are stockpiled to be readily available replacement items.

5. *Design.* Designs for various types and sizes of military bridging are prepared and published by the Army Facilities Components System. A theater headquarters may prepare and issue designs intended to utilize local materials and skills, simplify construction, or meet special load requirements. Officers responsible for the design and construction of bridges should adhere as closely as possible to standard designs unless there is good reason to depart from them, in which case the responsible engineer headquarters must do its own designing. However this policy should not preclude changes that would expedite work or economize labor or materials. For the techniques involved in designing a bridge, or computing the military load class of an existing bridge, see TM 5-312 and FM 5-36.

(3) *Site selection*

(a) In many cases there is little choice in the selection of a bridge site. New bridges are frequently located at the site of a destroyed bridge to use existing routes and abutments, piers and spans that are still in good condition. Usually an existing site was originally planned to provide the most economical bridge at the best location. However, if the enemy has destroyed the old bridge, it could take longer to remove the debris

than to develop a new site. These considerations must be weighed in each individual situation.

(b) Technical considerations such as soil conditions, height of banks, and stream characteristics also affect the time required for construction. The principal site conditions that must be considered in determining the most economical bridge are:

1. *Soil conditions.* The choice of a foundation for an intermediate or end support depends on soil conditions. The major considerations are the soil capacity and the possibility of scouring action. Normally the easiest and quickest type of foundation to construct is a spread footing; however, if there is a tendency to scour, piling is preferred. Spread footings may be used if adequately protected with riprap, sheet piling, or cribs. On soils of low bearing capacity spread footings are often inadequate necessitating the use of piles. Some knowledge of soil conditions at greater depths is required for pile foundations.

2. *Banks.* A low, flat, and marshy approach, or one subject to flooding, demands either a very long bridge, or a causeway over the flood plain, and a bridge over the stream. As a general rule it is better to use a causeway in conjunction with a bridge when the fill is less than 15 feet. When it is more than 15 feet it is easier to use a longer bridge. High banks necessitate either installing tall intermediate supports or cutting down the approaches to a practical grade—an operation which can involve much time. High banks are not a great disadvantage for gaps that can be bridged with a single span.

3. *Stream data.* The velocity, bottom conditions, depths, and width of the stream and the effect on the proposed bridge must be considered. The best bridge sites are generally found on straight runs where the stream is usually narrow. Flood frequency and level must be considered in determining the height of the roadway. Piers that cause the least obstruction to the flow of water and debris should be used, and must be designed for stability against the forces of floods, debris, or ice. A thorough investigation of civilian bridges in the vicinity, and consultation with the natives provide a sound basis for accurate estimation of unusual stream conditions. Navigational clearance generally need not be considered. However, if a river or canal is used to bring supplies by barge, provision should be made for the movement of river traffic.

4. *Construction principles*

(a) The construction of a bridge must be

well planned, and personnel and equipment must be used efficiently. A construction schedule that shows the number of men and the amount of equipment required, and their disposition throughout the project, helps to insure efficiency. The extent to which the construction schedule is developed depends on the time available.

(b) Standard designs, material sizes, methods of construction, and training are useful and economical in military practice. It is desirable to regulate the supply and stockpiling of materials and avoid too large a variety of sizes and shapes of timber, steel and other materials. Limiting the variety of materials helps to standardize designs, construction details, and construction methods, and results in a repetition of tasks that develops highly skilled construction personnel.

(c) Although using completely prefabricated bridge structures, rather than field-designed bridges always saves time, it is almost never more economical from a logistic standpoint. Therefore, prefabricated bridges are normally replaced by field-designed structures when the tide of battle has waned and time and materials are available. Many details of field-designed bridges can be standardized to provide advantages normally associated with prefabricated bridges.

c. *Railroads*

(1) *General.* Strategic, tactical, and logistic plans are greatly influenced by the rail transportation system, even in regions of moderate industrial development. New construction may be confined to key projects such as depot yards, transfer points connecting two systems of different gage, short bypasses or sidings to eliminate traffic bottlenecks, port-egress lines, expansion of terminal facilities, and short spurs to accommodate railway artillery and rail-transported launching facilities for guided missiles. Reconstruction is limited to the part of the system that is essential to military operations.

(2) *Responsibilities.* Although AR 55-650 assigns responsibility for new construction and for reconstruction of railroad facilities to the engineer service, and responsibility for ordinary maintenance to the transportation service, the engineer must be prepared to act on many borderline cases. In situations where the transportation officer and engineer cannot mutually determine the responsibility, their recommendations are referred to the command G4 for decision.

(3) *Special considerations.* The following information may assist the engineer in anticipating special problems:

(a) As a general rule, a type field army requires one double track line into its service area.

(b) The enemy can be expected to concentrate his demolition efforts on turnouts (switch points and frogs).

(c) Most railway bridging requirements can be satisfied by the simple steel-stringer type bridge supported on timber trestles or piles.

(d) Native railway-operating personnel are a source of information on existing operation and supply facilities in a liberated area.

(4) *Reconnaissance.* The surveys and studies and plans required for the construction of a railroad are more elaborate than those necessary for the construction of most roads.

(a) Studies are made of the best available topographic maps to narrow the choice of routes to be reconnoitered.

(b) Ground reconnaissance is made of the possible routes. Items to be noted include odometer and barometer observations of distances and elevations, general character of the terrain, controlling curvatures, soil and drainage conditions, bridge and tunnel sites, the size and character of bridges needed, intersections with railways or important roads, availability of ballast and other construction material and points at which construction parties would have access to the railway route.

(c) A preliminary survey is then made which includes cross-sections along the feasible routes. Trail locations are plotted and adjusted to give the best balance of grades, compensated grades, cuts, and fills. This establishes or fixes the line of the railroad.

(d) The precise line is then located by field survey parties and staked. This calls for much more precision than the location survey of most new roads, since the curves of a railway and superelevations must be accurately computed.

(5) *New construction principles.* Except in the most primitive areas, the basis of the military transportation service in a theater of operations is the existing transportation network and its facilities, expanded as required to meet the total traffic load. All transportation in the theater must be organized into one system, each part supplementing the other, and all directed toward the theater requirements. The existing transportation facilities normally follow a nonmilitary pattern which may not correspond to the tactical plan. The logistic plan of support, however, is greatly influenced

by the existing transportation system since maximum use must be made of the available system to expedite the operation. As in all other types of construction, it is necessary to hold new construction to a minimum to reduce material and material transportation requirements. See TM 5-370 for military railway construction details.

d. Pipeline Construction.

(1) The construction of a military petroleum pipeline system in a theater of operations is an intersectional service operation involving the materiel command, the engineer command, and the transportation command (fig. 2-4). The materiel command has the dominant interest and responsibility in preparing coordinated broad plans and policies for the supply and distribution of petroleum products. The transportation command provides for all but pipeline and local distribution of bulk and packaged petroleum products by military and commercial means. Transportation truck units habitually engaged in intersectional movement of bulk petroleum products are normally assigned to the senior petroleum operating headquarters. The engineer command provides for the design and construction of petroleum pipeline, storage, and dispensing facilities. Design data for these facilities are coordinated with the senior petroleum operating headquarters that will be responsible for the operation of the system. Maintenance of petroleum pipelines and related facilities is a divided responsibility of the materiel command and the engineer command. Organizational and direct-support maintenance of fixed pipeline installations is the responsibility of the operating units. When major repairs and special heavy-duty engineer equipment are required, or maintenance necessitates removal of pipeline equipment from the line, engineer units are responsible. In essence, quartermaster units perform organizational maintenance (AR 703-1). For a more definitive examination of engineer and quartermaster responsibilities refer to the TM 10-1100-series, and FM 10-67. When assigned the job specifically, on request of the Air Force, engineer units install and maintain Air Force fixed bulk reduction and dispensing facilities. Additionally, engineer units perform all categories of maintenance on petroleum drilling and producing equipment and refining facilities. (For a more complete discussion of the delineation of maintenance responsibilities, refer to FM 10-67, TM 5-343, and TM 10-1109.)

(2) The responsible engineer headquarters prepares the construction plans for petroleum handling systems; and it commands, supervises,

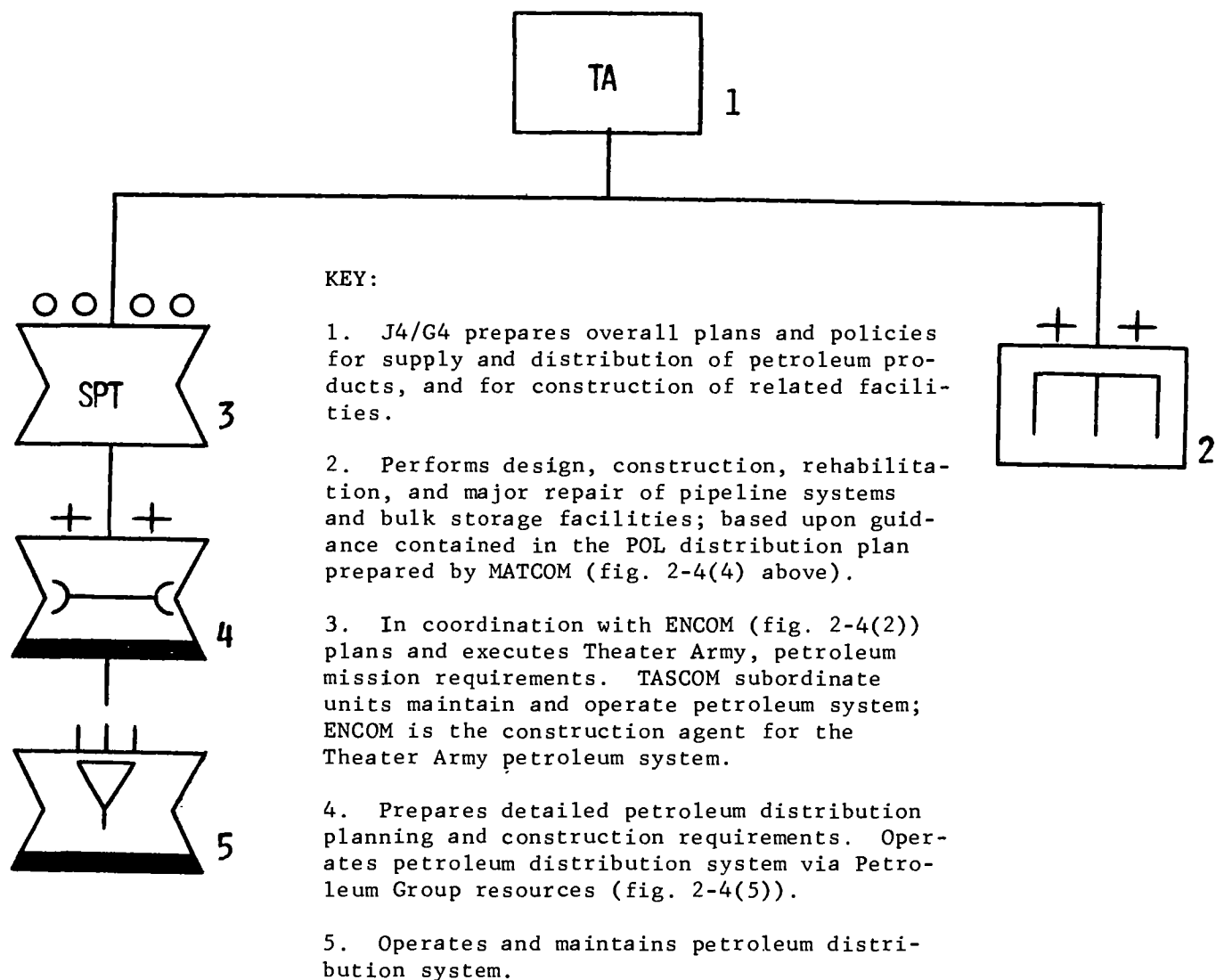


Figure 2-4. Petroleum responsibilities in a type theater army.

and inspects all aspects of a petroleum pipeline construction project. Port construction companies are responsible for constructing POL marine terminal facilities—tanker unloading facilities, submarine petroleum pipelines, and overland petroleum pipelines to and including the first onshore manifold facility. At this point, construction battalions, augmented by engineer pipeline construction support company personnel and equipment, construct permanent or hasty storage facilities and overland pipelines, and install the related facilities such as pumps, valves, filters, and traps.

(3) Advanced construction of POL facilities in the field army area normally is accomplished by construction battalions and engineer pipeline construction support companies sent forward from the COMMZ on a mission-type basis. Temporary

rigid pipeline and flexible pipeline systems (assault pipelines) normally will be installed and recovered by combat engineer battalions of the field army.

(4) The magnitude of the task of supplying a theater of operations with the class III supplies required for its operation makes detailed planning essential. Special consideration must be given to design of the theater pipeline system, stockpiling of the vast amounts of pipe and related facilities, maximum use of specialized troops and equipment, and dispersion of completed facilities. (See FM 10-67, TM 5-343, TM 5-301, TM 5-302, TM 5-303, and appropriate 10-series TMs.)

e. Ports.

(1) *General.* Obtaining adequate ports early

in any oversea operation is so important that securing them is one of the initial objectives of a campaign. The construction of new ports is undesirable as it requires a large amount of manpower, materials, and time and probably would lack the desirable urban community at or near the site. Generally, temporary ports and landing facilities are used in the initial phase of an invasion and initial followup logistics-over-the-shore (LOTS) operations. As established port areas are acquired or rehabilitated, beach sites are abandoned. However, certain areas of operations, such as Southeast Asia, may require use of beach sites for extended periods of time. It is improbable that an existing port will have the precise facilities needed; and if the port has been under enemy control, damage will probably be extensive. Therefore, construction of ports in a theater of operations consists of repairing, rebuilding, enlarging, or adding new facilities. Much of this type of construction is done in and over water. In the construction of port shore installations, such as warehouses, roads, and railroad track, standard military construction procedures are followed. Special consideration and priority of effort must be given to construction rehabilitation, or improvement of marine POL terminal facilities, to achieve an early capability for off-loading POL tankers and lighters. As a passive protection measure, POL facilities should be dispersed and sited away from other port facilities. The port ammunition handling facilities must be constructed in accordance with the provisions of TM 9-1300-206. This technical manual prescribes the quantity-distances that must be observed in the construction of transportation holding yards and storage areas.

(2) Responsibilities.

(a) *General.* The operation of a port in a theater of operations is a large and important undertaking, with many divisions of responsibility between the Navy and the service forces within the Army. Basic decisions as to the location of ports, capacity, utilization, wharfage, and storage facilities are made at theater headquarters and TASCOM headquarters levels. The numerous units involved are coordinated through the commander and staff of a transportation terminal command. The TASCOM ACofS, movements, is responsible for operating ports and furnishing liaison with the Navy, Coast Guard, and other interested military and authorized civilian agencies of Allied countries and the United States. Engineers construct and maintain new

ports and rehabilitate captured ports. Engineer responsibility includes minor salvage operations, such as clearing obstructions and debris from harbor entrances and channel improvement, but does not include large-scale salvaging, which is a Navy responsibility.

(b) *Engineer responsibilities.* In the construction of ports the engineer is normally charged with the following duties:

1. Construction and repair of breakwaters, docks, piers, wharves, quays, moles, and landing stages.
2. Reconstruction of utilities and clearance of debris within the port area.
3. Dredging.
4. Repair of roads and railroads in the port area.
5. Firefighting.
6. Acquisition of buildings, facilities, and other property within the port area for military use.
7. Provision of warehouses, depots, quarters for transients and port personnel, tank farms, container storage areas, roads, railroads, and utilities in a large port expansion or rehabilitation operation. Such a project is usually assigned to an engineer construction group which has, in addition to the specialized port construction units, construction battalions, dump truck companies, engineer pipeline companies, and other units as needed.

(3) Special considerations.

(a) Essential to successful port construction is careful planning based on extensive and detailed port reconnaissance. Reconnaissance should be conducted throughout the action up to actual occupation. Even though initial planning may have been completed before occupation, last minute enemy action may necessitate a major change in plans. Other equally important factors to be considered in port reconstruction include the availability of necessary construction materials and special nonorganic equipment, such as dredges, lighters, and floating shops. The order and shipping time on these items may be 3 months or more.

(b) Because of mines and demolitions, unloading capacities are nearly always extremely limited immediately following the capture of a port area, while, at the same time, the demand for supplies for direct support of combat operations may be urgent. The engineer can do little to improve this situation until considerable tonnage of his reconstruction materials and equipment has

been unloaded. Unloading priority is therefore a command decision based on the situation.

(c) Planned structures should be based on the simplest type of construction such as timber piling, or timber trestles, so that materials can be readily adapted to unexpected conditions.

(d) Under favorable conditions, timber piling and lumber can be rafted short distances directly to the worksite to conserve shipping.

(e) Waterline facilities are usually provided in the following order:

1. Ramps for landing craft and amphibious vehicles.
2. Beach roads.
3. Marginal piers for shallow-draft vessels.
4. Rapidly emplaced pier facilities (self-elevating piers).
5. Berths for deep-draft vessels.

(f) The best interest of the overall operation may be served by partially operating port structures simultaneously with their reconstruction, even though such operations hinder the engineer effort.

(g) The ultimate capacity of a port is more frequently limited by its highway- and rail-egress facilities than by its waterside facilities.

(h) A physical appointment of areas of a port between two Allied forces or between the Army and Navy should be avoided since it requires extensive coordination, particularly in regard to rehabilitation and operation of common facilities, such as utilities and rail yards.

(i) Technical assistance on highly special-

ized matters such as electrical circuits, operation of tidal locks, operation of existing cargo-handling equipment, and information on foundation conditions may be obtained from local port authorities. Prisoners of war may be a source of this highly skilled labor.

(j) A liberal proportion of the personnel making up port construction units should be drawn from civilian construction firms experienced in this type of work. Even then, however, the units require extensive training.

(k) Very large-scale port work, or work involving heavier or more specialized equipment than is organic to the port construction company, may need to be supplemented by other engineer units or by civilian labor. For underwater excavation beyond the capability of the company's organic equipment, the unit must rely upon floating dredges manned by either civilian or engineer dredge crew units, such as one of the TOE 5-550 teams. Detailed information on tides, depths, wave heights, and bottom conditions may be obtained from the military hydrology team (when organized) assigned to the theater. (For further information see TOE 5-540.)

(l) The engineer company, port construction, normally operates as one element of a large-scale coordinated construction operation under an engineer construction group or brigade, along with dredging teams, construction battalions, dump truck companies, and other units as required. The company does not normally engage in routine maintenance or minor repair of port facilities.

(m) For details on the construction and rehabilitation of ports, see TM 5-360.

Section III. SPECIAL ENGINEER ACTIVITIES

2-13. Engineers in the Cold War

a. The cold war has created a definite need for US military construction engineers as advisors to indigenous military engineer forces and indigenous civilian communities engaged in stability operations and civic action programs. To meet this need, TOE 5-560 provides three types of engineer civic action teams. These teams may be combined in various groupings, depending on the situation, to form engineer detachments that can operate in a stability operations role as part of US Army Special Action Forces (FM 31-22 and FM 31-23). These teams may also assist in civic action programs in countries where there is no threat of insurgency. When so used they operate under the

Military Assistance Advisory Group or other US military authority.

(1) *Team KA, engineer civic action headquarters.* This team provides supervision and staff planning for the operation of all engineer elements assigned or attached to a special action force. It also provides an engineer staff to a special action force and administrative support for subordinate teams.

(2) *Team KB, engineer civic action control.* This team provides engineer staff personnel for a special forces command and control element subordinate to the special action force. It also provides supervision staff planning, coordination, and administrative support for subordinate engineer teams.

(3) *Team KC, engineer civic action advisory.* Team KC provides—

(a) Advice and assistance to host country engineer forces on civic action projects such as farm-to-market roads, bridges, village wells, and sanitation measures, and construction of schools, hospitals, and other public buildings.

(b) Assistance to host country engineer units in preparing to support their own tactical troops for internal defense and internal development operations.

(c) Advice and assistance to US military forces when committed in support of host country forces.

(d) Supervision of operations with host country counterparts.

b. Basis of Allocation.

(1) Team KA, engineer civic action headquarters, is allocated on the basis of one per two or three engineer civic action control teams (KB).

(2) Team KB, engineer civic action control, is allocated on the basis of one per four to nine engineer civic action advisory teams (KC).

(3) Team KC, engineer civic action advisory, is allocated on the basis of one per host country force comparable in size to a US Army engineer combat battalion, or one per municipal area for civic action as required.

2-14. Engineer Activities in a Nuclear Environment

a. Nuclear weapons employed by and against friendly forces can so alter the terrain that requirements for engineer effort of all types may be overwhelming when considered in the conventional sense. Engineer operations must be governed by a strict system of priorities to realize the operational objectives of the supported force. The highest priorities for engineer support are maintaining the mobility of the supported force and impeding mobility of the enemy. Additional priority missions for engineer units may be construction of shelters and advising and assisting combat units in the construction of fighting positions.

b. Good maneuver routes and early route reconnaissance are particularly important because forces are dispersed and control is decentralized.

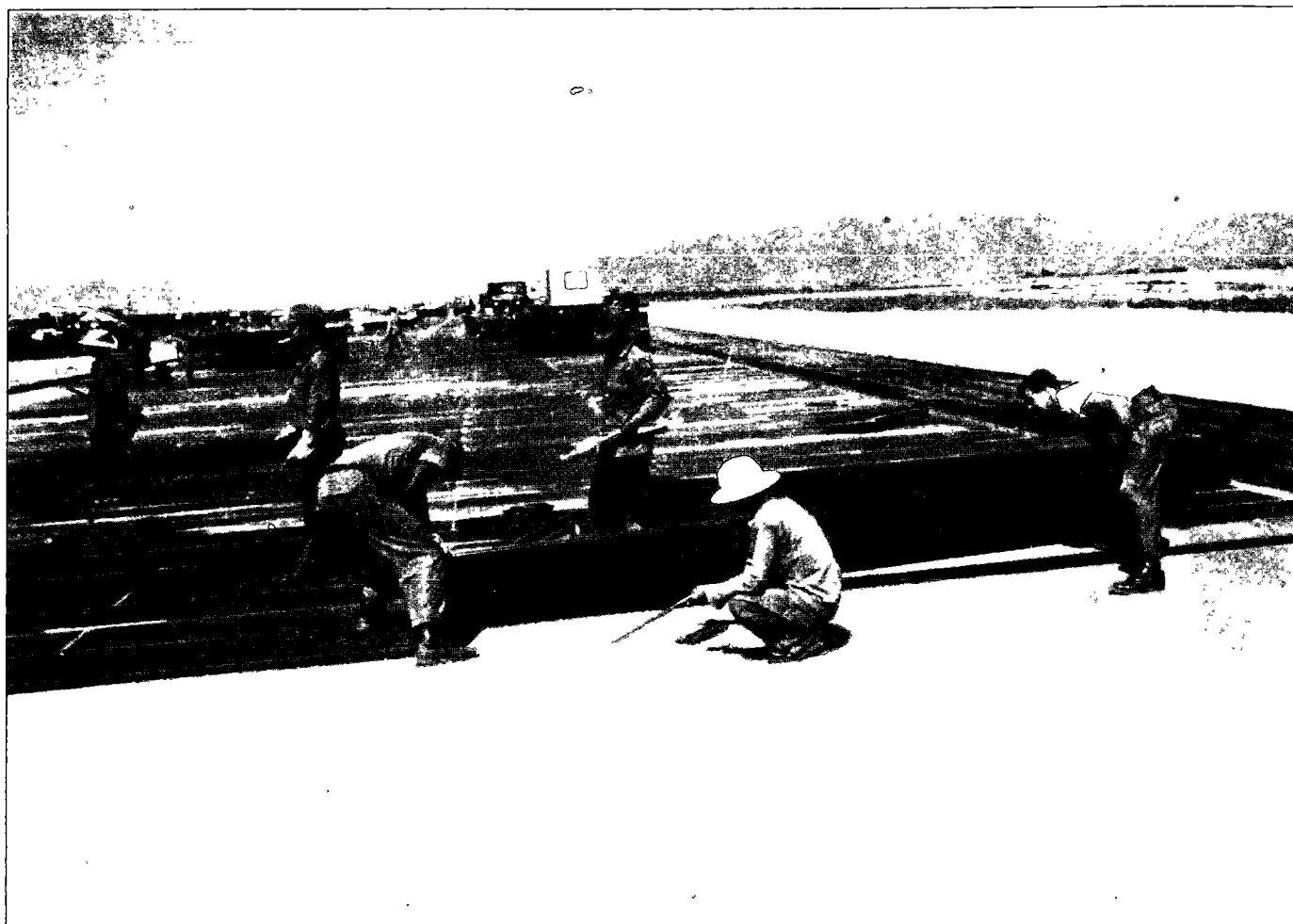


Figure 2-5. Airfield construction in a theater of operations: task common to an engineer construction battalion and showing the utilization of indigenous labor.

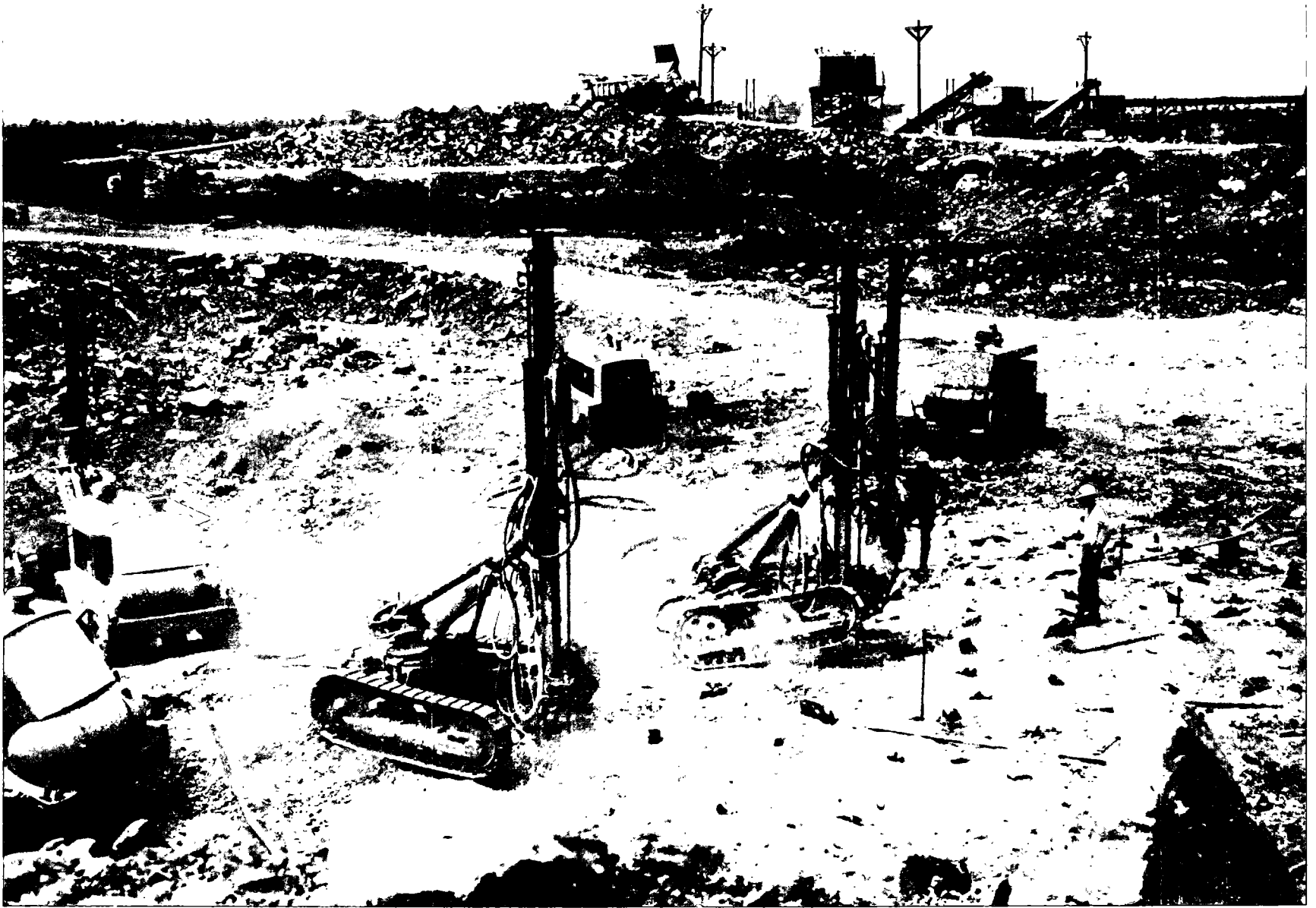


Figure 2-6. Drilling operations commonly performed by an engineer construction support company.



Figure 2-7. Land clearing operation common to the engineer land clearing company.



Figure 2-8. Construction common to civic action projects.



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CHAPTER 3

ENGINEER COMMAND

3-1. Mission

The mission of the engineer command is to perform operational planning and supervision; and to command and coordinate the activities of assigned or attached engineer construction brigades, groups, and other units engaged in construction, mapping, production of military geographic intelligence, RPMA, and related activities.

3-2. Assignment

The engineer command is assigned to, and allocated on the basis of one per theater army. It may be further assigned to a theater army support command when such a command is organized. It is physically located in the communications zone (COMMZ).

3-3. Composition of the Engineer Command

The engineer command is a flexible organization which may be tailored to fit the operational environment of a theater of operations. The engineer command normally is employed when construction and other engineer support requirements exceed those that can be provided by an engineer brigade. For a force in excess of 12 divisions, or when the complexity of the construction mission or the geographic conformation dictates, the engineer command may be composed of an engineer base topographic battalion and from two to three engineer construction brigades. Each brigade may control from two to four engineer construction groups, and selected teams of the TOE 5-500-series. Additionally, the engineer command has the responsibility for RPMA in the TO (COMMZ and combat zone) to include command of RPMA units as assigned. Basically, the command consists of a headquarters and headquarters company and a variable number and composition of attached units but may comprise the following:

- a. Engineer construction brigades.
- b. Engineer construction groups.
- c. Engineer construction units.

d. Engineer construction support units.

e. Engineer base topographic battalion.

f. Teams of the engineer service organization (TOE 5-500).

g. Engineer RPMA units.

3-4. Capabilities

a. The engineer command may be organized under the levels 1, 2, or 3 columns of TOE 5-201.

(1) *Level 1.* When organized under level 1, this unit has full capabilities to execute the stated mission and provides:

(a) General troop and contractual construction support to the Army and other Services and allies within the communication zone and support to the field army on a task basis, as required.

(b) Planning, coordination, and supervision of construction or rehabilitation of aircraft landing facilities, ports, routes of communication (roads, railroads, and inland waterways), missile sites, depots, hospitals, troop camps, PW and internee compounds, administrative and logistic facilities, POL distribution and storage facilities, and operational and training facilities.

(c) Allocation of engineer troops, materials and equipment to projects; and guidance and technical assistance to units engaged in construction projects.

(d) Topographic and military geographic intelligence support to theater army including programing data for mapping and military geographic intelligence support, and coordination of requirements with CONUS, production of required mapping and military geographic intelligence; and providing military hydrology services.

(e) Comptroller services for the command and assigned or attached units.

(f) Management of real estate and real property maintenance activities (RPMA).

(g) Organizational maintenance on organic equipment.

(h) Supervision of contract construction, contract labor and indigenous personnel.

(i) Rotary and fixed wing aircraft for the purpose of:

1. Command, control, and coordination.
2. Reconnaissance.

(2) *Levels 2 and 3.* See paragraph 2-4a.

b. When the mission to be performed or the workload imposed on this unit exceeds the capabilities indicated above, the additional capabilities required must be provided from appropriate cellular teams of the 5-500-series TOE or by the establishment of a modification table of organization and equipment (MTOE) under the provisions of AR 310-31.

c. *Type B Unit.* This unit is not adaptable to type B organization.

d. *Additional Capabilities.* This unit depends on a finance company, TOE 14-17, for finance services; a transportation car company, TOE 55-19, for daily administrative motor transport services; a personnel service company, TOE 12-67, for personnel administrative support; TOE 11-147 for internal communications and the theater army signal command for interconnection into the theater area communications system; and on appropriate elements from the medical command for medical service and advice.

e. Individuals of this organization, except chaplain, can engage in effective, coordinated defense of the unit's area or installation.

3-5. Basis of Allocation

One per theater army.

3-6. Category

This unit is designated a category III unit. (See unit categories, AR 310-25.)

3-7. Mobility

This unit is 8 percent mobile in organic vehicles. When it displaces, additional general-purpose transportation is required for 21 tons of supplies and equipment and 159 personnel.

3-8. Organization

The engineer command is a flexible organization that can tailor and control construction throughout the COMMZ, displacing construction effort forward to accomplish specific tasks as required

in the field army area. The number and composition of the units assigned or attached depend on the assigned theater mission(s). The headquarters and headquarters company is a fixed organization (TOE 5-201) consisting of the elements shown in figure 3-1 and described in paragraphs 3-9 through 3-20.

3-9. Command Section

This section contains the command element of the engineer command and the commanding general's special staff consisting of the information, inspector general, and judge advocate sections. The commanding general and his deputy, who compose the command element, command and coordinate the activities of the engineer command. They also assist the theater commander and his staff on all engineer matters relative to construction, mapping, military geographic intelligence, RPMA, and related activities in the communications zone or interzonal activities when tasked.

a. *Information Section.* This section consists of an information officer and four enlisted assistants who perform the following functions:

(1) Advise the commander and staff on all aspects of troop information, public information, and command relations with the public.

(2) Coordinate and supervise all public and troop information functions within the command, (including information planning, disseminating troop information, and preparing press releases and similar reports.

(3) Disseminate information pertaining to the command through the appropriate media in accordance with established theater, command, and security policies.

(4) Plan positive and continuing public relations programs to gain and maintain public understanding, good will and support.

(5) Maintain liaison with, receive, escort, and control certain activities of civilian and military information media representatives.

(6) Observe and analyze trends generated by public opinion.

(7) Prepare the public understanding and troop information portions of SOP's and operating plans and orders.

b. *The Inspector General Section.* This section consists of the inspector general (IG), his assistant, and two enlisted administrative assistants. The IG and his staff are responsible for IG functions as outlined in paragraph 4-43, FM 101-5.

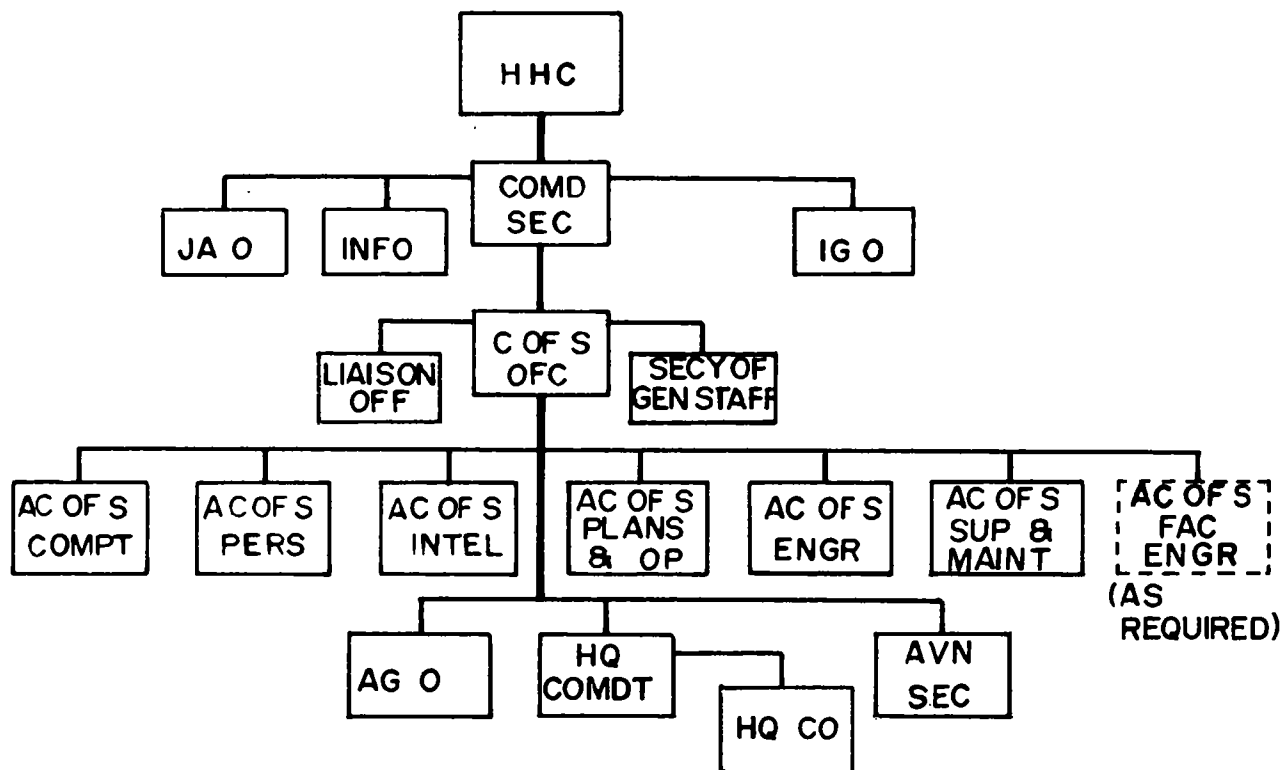


Figure 3-1. Organization chart, headquarters and headquarters company, engineer command.

c. *The Staff Judge Advocate Section.* This section consists of the staff judge advocate (SJA), his deputy, three officer assistants, one warrant officer, and four enlisted assistants. The SJA's functions include—

(1) Supervising the administration of military justice.

(2) Furnishing legal advice and assistance to military and other authorized personnel of the command concerning personal legal problems of a civil nature.

(3) Administering claims, including certification for payment when appropriate.

(4) Providing legal opinions on internal law matters.

(5) Examining procurement contracts and furnishing advice to them.

(6) Determining legal implications pertaining to real estate transactions (para 4-50, FM 101-5).

3-10. The Chief of Staff (CofS)

Personnel of this section coordinate the efforts of the staff and assure prompt and efficient staff response to the requirements of the commanding general. Included in the CofS section are the sec-

retary to the general staff and the liaison officers. The liaison officer fulfills the CofS's responsibility to maintain continuity in the interchange of information and promote cooperation and coordination of effort between the engineer command and theater army or TASCOC. Liaison officers from other commands are also housed in the CofS section. See paragraphs 4-3 and 4-4, FM 101-5 for the CofS's responsibilities.

3-11. Assistant Chief of Staff, Comptroller (ACofS, Compt)

Duties of the ACofS, Compt, are outlined in paragraphs 4-4 and 4-10, FM 101-5.

3-12. Assistant Chief of Staff, Personnel (ACofS, Pers)

Members of this staff section are concerned with the management of personnel and replacements for the command. The personnel management function is primarily engaged in processing personnel records and reports and managing non-US civilians. Assisted by the personnel management officer and the personnel services officer, the ACofS, Pers, supervises the overall operation of the personnel management and services functions

and recommends assignment of officers on the basis of command requirements. The personnel management supervisor and personnel staff NCO, review records of senior NCOs and recommend assignments on the basis of the command's needs and the individual's qualifications. The personnel section also contains the chaplain and his enlisted assistant. The chaplain advises the commander on matters of morality, religion, and morale; coordinates religious ministration; furnishes religious information; and recommends and plans within these areas. The chaplain maintains religious liaison with higher and adjacent headquarters as required. (For additional details see paragraph 4-19, FM 101-5.)

3-13. Assistant Chief of Staff, Intelligence (ACofS, Intel)

The ACofS, Intel, is the principal staff assistant to the commander in military intelligence and counterintelligence matters. He advises and assists other staff officers in the intelligence phases of the functional areas for which they are responsible. The ACofS, Intel, for the engineer command is provided the skilled personnel and equipment for map program planning and technical supervision of map compilation, surveying and geodetic activities. He also supervises the topographic and map distribution point program including operation of map distribution and distribution points throughout the command. The ACofS, Intel, is the staff topographic specialist and acts as the senior control officer for all topographic activities. (For further details see paragraph 4-6, FM 101-5.)

3-14. Assistant Chief of Staff, Engineering (ACofS, Engr)

The ACofS, Engr, is responsible for functions pertaining to engineer design and construction within the command. These functions include design of such installations and facilities as ports, routes of communication, airfields and related facilities, pipelines and bulk POL storage areas, building complexes such as cantonments, warehouses, and prisoner of war enclosures, railroads, and other vertical and horizontal construction required in a theater of operations. To assist him, he has a staff of officers and enlisted men technically qualified in design, utilities, and construction functions. The structural planning and design functions are headed by the chief of the engineer branch, who is assisted by the construction engineer, civil engineer, assistant construction engineer, and assistant civil engineer. The electrical,

pipeline, port construction and railway engineers all plan, direct and supervise design, construction, installation and maintenance of the systems or facilities indicated by their titles. The public works and utilities officer and assistant serve as technical consultants on problems related to construction, maintenance, and operation of public works and utilities. The soils engineer directs surveys and investigations of soils to determine their condition and probable effect on planned construction projects. The real estate officer is the real estate policy officer for the command and, as such, develops policy statements for the commander. He also prepares estimates of real estate requirements for military operations and acts as liaison and coordinating officer between the engineer command and the theater army. (These duties are performed by the ACofS, Facilities engineering, (Fac Engr) when one is established.) The safety engineer is concerned with the safety aspects of design criteria and is the construction safety advisor for the command. He inspects installations, construction, and facilities for safety hazards, acts as investigating officer in cases requiring examination; and organizes and supervises the command safety program. The enlisted personnel provide assistance to members of the various functional staff areas, and perform other duties as assigned. (See paragraphs 4-13 and 4-37, FM 101-5.)

3-15. Assistant Chief of Staff, Supply and Maintenance, (ACofS, S&M)

This staff section supervises and coordinates activities pertaining to Class IV stocks and equipment required to support projects. The section works closely with the ACofS, Engr, to assure that supplies and equipment are available when required for projects. Duties also include formulation of plans, policies, and directives pertaining to logistics and maintenance. The maintenance officer provides the technical knowledge required to formulate equipment maintenance plans and directives and also coordinates repair activities between the assigned units and repair facilities. The supply officer and project materials officer plan and schedule the flow of materials for major construction projects. They also enter the supply chain, when required, to solve organizational supply problems. The procurement officer (in the absence of an ACofS, Facilities Engineering) provides the means for procuring utility services for the command. Before the area service command is established, the procurement officer must make

arrangements for the procurement of commercial power, water, and sewage services for the command. The senior logistics supervisor and the maintenance, supply, materiel readiness, and project materials NCOs all provide enlisted assistance within their respective areas. (For details about duties of the ACofS, S&M see paragraphs 4-14 and 4-15, FM 101-5.)

3-16. Assistant Chief of Staff, Plans and Operation (ACofS, Plans/Op)

The ACofS, Plans/Op is responsible for the preparation of current and long-range plans, procedures, policies, and programs pertaining to operations and functions of the engineer command. This section:

- a. Develops and maintains the troop basis.
- b. Develops the command operations order.
- c. Develops policies and guidance for and evaluates the training of the command.
- d. Coordinates displacement of subordinate units and assignment of facilities. The Assistant Chief of Staff, Plans and Operations, has a staff consisting of an operations officer, rear area protection officer, and a troop operations officer. He also has an installation services engineer and a real estate officer who are responsible for staff planning and construction activities in their respective areas when the position of ACofS, Facilities Engineering, is not organized. The aviation staff officer advises the commanding general and his staff on aviation matters including formulation of policies and coordinated employment of aircraft within the command. Enlisted draftsmen and technical and clerical personnel are also included to provide necessary support for the section. (See paragraphs 4-7, 4-12, and 4-20, FM 101-5, for more complete coverage of the functions and responsibilities of the ACofS, Plans/Op.)

3-17. Adjutant General's Office (AG)

This office operates under the staff supervision of the ACofS, Personnel, and performs the usual duties of headquarters administration. The functions of this office include:

- a. Provision of internal administrative services for the headquarters, including message center services, reproduction facilities, central classified document control and repository, and library

service for the headquarters correspondence and publications.

- b. Coordination with the servicing Army post office for receipt and dispatch of headquarters official mail.

- c. Reproduction of administrative orders, bulletins, letters, and other administrative publications.

- d. Messenger service between elements of the headquarters and higher and adjacent headquarters (para 4-28, FM 101-5).

3-18. Aviation Section

This section provides the necessary aircraft and personnel to support the engineer command's requirements for aerial reconnaissance for purposes of evaluating sources of engineer materiel, route reconnaissance and related engineer intelligence, requirement for topographic and related mapping functions, and other reconnaissance functions as determined by the commander. Additionally, the aviation section provides the commander with a means to effect better command, control, and coordination by reducing the time-travel distances to subordinate units. Technical supervision of the aviation section is exercised by the ACofS, Plans-Op, through the aviation staff officer.

3-19. Assistant Chief of Staff, Facilities Engineering (ACofS, Fac Engr)

The size of the theater of operations and the scale of RPMA activities may dictate that the ENCOM designate a separate staff element to administer RPMA functions. In this role the ACofS, Fac Engr, would advise the ENCOM commander on the operating procedures for the procurement of all real estate and civilian labor, and the requirement and allocation thereof. He also would exercise technical supervision over engineer units for procurement of real estate and labor; advise the ENCOM commander on theater RPMA matters; and exercise technical supervision over RPMA units performing these functions, in accordance with the policies and instructions of the theater commander.

3-20. Headquarters Commandant and Company Headquarters

The headquarters commandant is responsible for supervision of security, training, motor and air transport, and other support activities required by the headquarters. The headquarters comman-

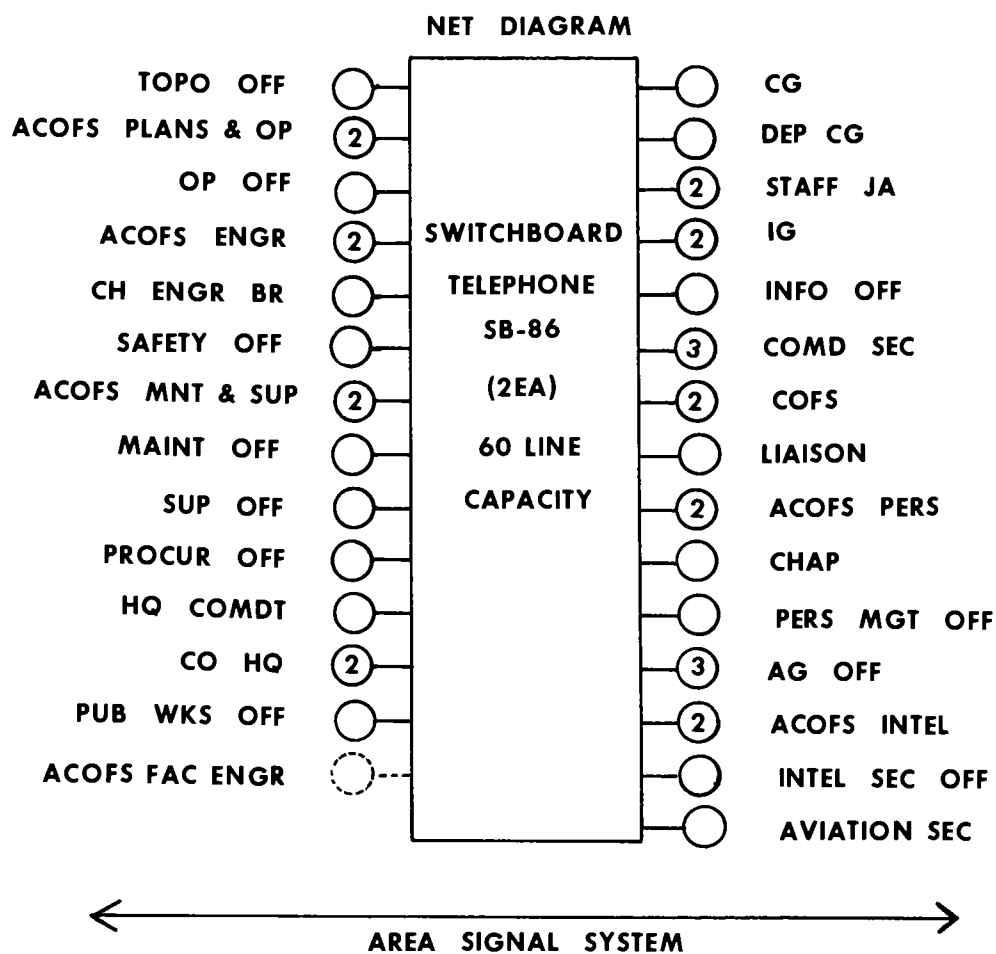
dant, as indicated by his title, coordinates the support activities. He is assisted by an administrative NCO and a clerk-typist. Company headquarters has the personnel and equipment to support headquarters operations with company personnel administration, supply, mess, motor transport, maintenance, and personal staff for the two general officers.

3-21. Items of Equipment

The equipment of headquarters and headquarters company, engineer command, is limited to individual equipment and that needed for housekeeping, local security, communications, ground transportation, administration and engineer control. For the major items of equipment of the attached units of the engineer command, see the discussion of the individual units.

3-22. Communications

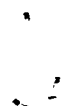
The engineer command is dependent upon the area communications system for normal, routine communications with assigned units and higher and lateral commands. The US Army Strategic Communications Command (USASTRATCOM) (theater) operates the theater army communications system (TACS) throughout the COMMZ. Communications within headquarters of the engineer command normally will be installed, operated, and maintained by signal operations units of the theater army signal operations command. Entry into the TACS from local communications switchboard and communications centers is normally provided by signal units of the signal operations command. Figure 3-2 indicates telephone and other internal wire net requirements. Installation of all circuitry and that communications equipment not authorized the engineer command by TOE 5-201 is to be provided by appropriate signal units.



O-FIELD TELEPHONE TA-312

○-FIELD TELEPHONE TA-312 (AS REQ'D)

Figure 3-2. Wire net, engineer command.



CHAPTER 4

ENGINEER CONSTRUCTION BRIGADE

4-1. Mission

The mission of the engineer construction brigade is to command assigned and attached units and coordinate the engineer construction activities within the appropriate command.

4-2. Assignment

The engineer construction brigade normally is located in the communications zone and is assigned to the engineer command.

4-3. Capabilities

a. Level 1. At level 1 the engineer construction brigade is capable of:

(1) Commanding and supervising a force of two to four engineer construction groups and other assigned/attached units.

(2) Planning, coordinating, and supervising construction or rehabilitation of ports, routes of communication, airfields, heliports, depots, hospitals, troop camps, administrative facilities, PW compounds, POL distribution/storage facilities, and protective structures.

(3) Providing operational plans, project plans, designs, and construction directives; allocating troops, materials, and equipment to projects; and providing guidance and technical assistance to units engaged in construction projects.

(4) Providing rotary-wing aircraft to facilitate construction support activities and reconnaissance activities.

(5) Serving as control headquarters for a separate task force to plan, design, supervise, and coordinate major construction projects.

(6) Supervising contract construction, contract labor, and indigenous personnel.

b. Levels 2 and 3. See paragraph 2-4a.

c. Type B Unit. As the brigade is composed primarily of command and staff personnel, headquarters and headquarters company, brigade, it is not adaptable to a type B organization.

d. Combat Capabilities. Individuals of this organization, except the chaplain and medical personnel, can engage in effective, coordinated defense of the unit's area or installation.

e. This unit depends on other supporting theater army support command elements for personnel, legal, and health services, and communications facilities when requirements exceed organic capability.

f. When supported by TOE 5-530, Team HB, has capability to design large pipelines and installations for the distribution and storage of POL.

g. This unit can perform organizational maintenance on organic equipment.

4-4. Organization

The engineer construction brigade is a flexible organization. The number and composition of the units attached to it depend upon its mission. Its headquarters and headquarters company, however, is a fixed organization (fig. 4-1) and is organized under section I, TOE 5-111. It consists of two elements as follows:

a. Brigade Headquarters. The brigade headquarters consists of a brigade commander, deputy, S1, S2, S3, S4, aide-de-camp, chaplain, surgeon, engineer equipment officer, chemical staff officer, communications-electronics (C-E) staff officer, civil engineer, and sergeant major.

b. Headquarters Company. Headquarters company consists of a company headquarters and the personnel of the following operating sections of the brigade: Administration section, operations and intelligence, engineering and plans, supply and maintenance, communications, and aviation.

4-5. Duties and Functions

In the mission of commanding, planning, supervising, and coordinating the activities of the brigade and other assigned/attached units, the brigade commander, his staff, and the staff sections

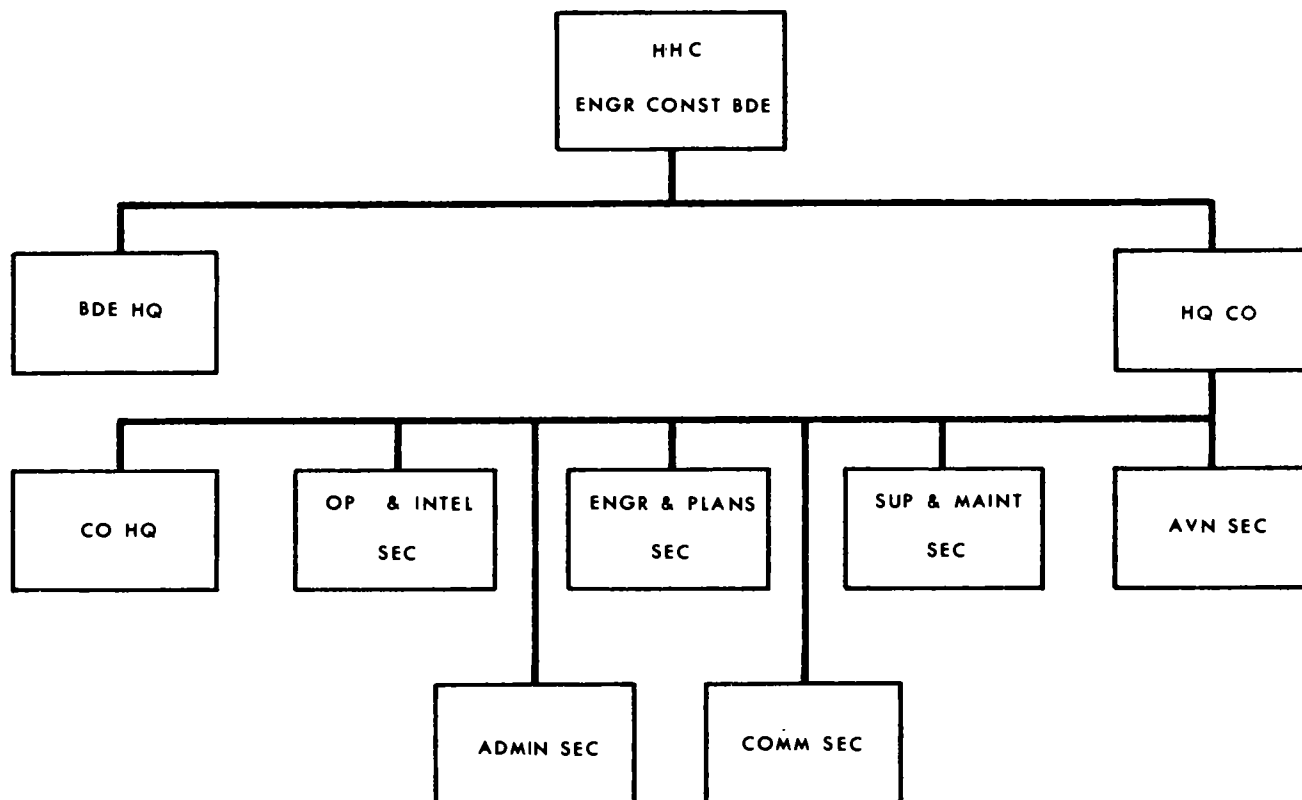


Figure 4-1. Organizational chart, headquarters and headquarters company, engineer construction brigade.

perform the duties and the functions outlined in FM 5-1, FM 101-5, AR 611-101, AR 611-112, and AR 611-201.

4-6. Basis of Allocation

One per two to four engineer construction groups.

4-7. Category

This unit is designated a category III unit. (See unit categories, AR 310-25.)

4-8. Mobility

Approximately 66 percent mobile in organic transportation.

4-9. Employment

The brigade is employed whenever the construction activity exceeds the coordination and supervision capabilities of a single engineer construction group and when direct command of from two to four engineer construction groups and other engineer units is desired. The brigade plans, coordinates, and supervises construction or rehabilita-

tion of ports, routes of communication, depots, hospitals, troop camps, administrative facilities, POL distribution and storage facilities, and airfields and related Air Force projects. One or more engineer construction brigades are assigned to a type theater army with further assignment to the engineer command. The brigade's area of responsibility covers all or part of the communications zone. Any construction or construction support in support of the combat engineers in the combat zone is accomplished by the brigade on a mission basis.

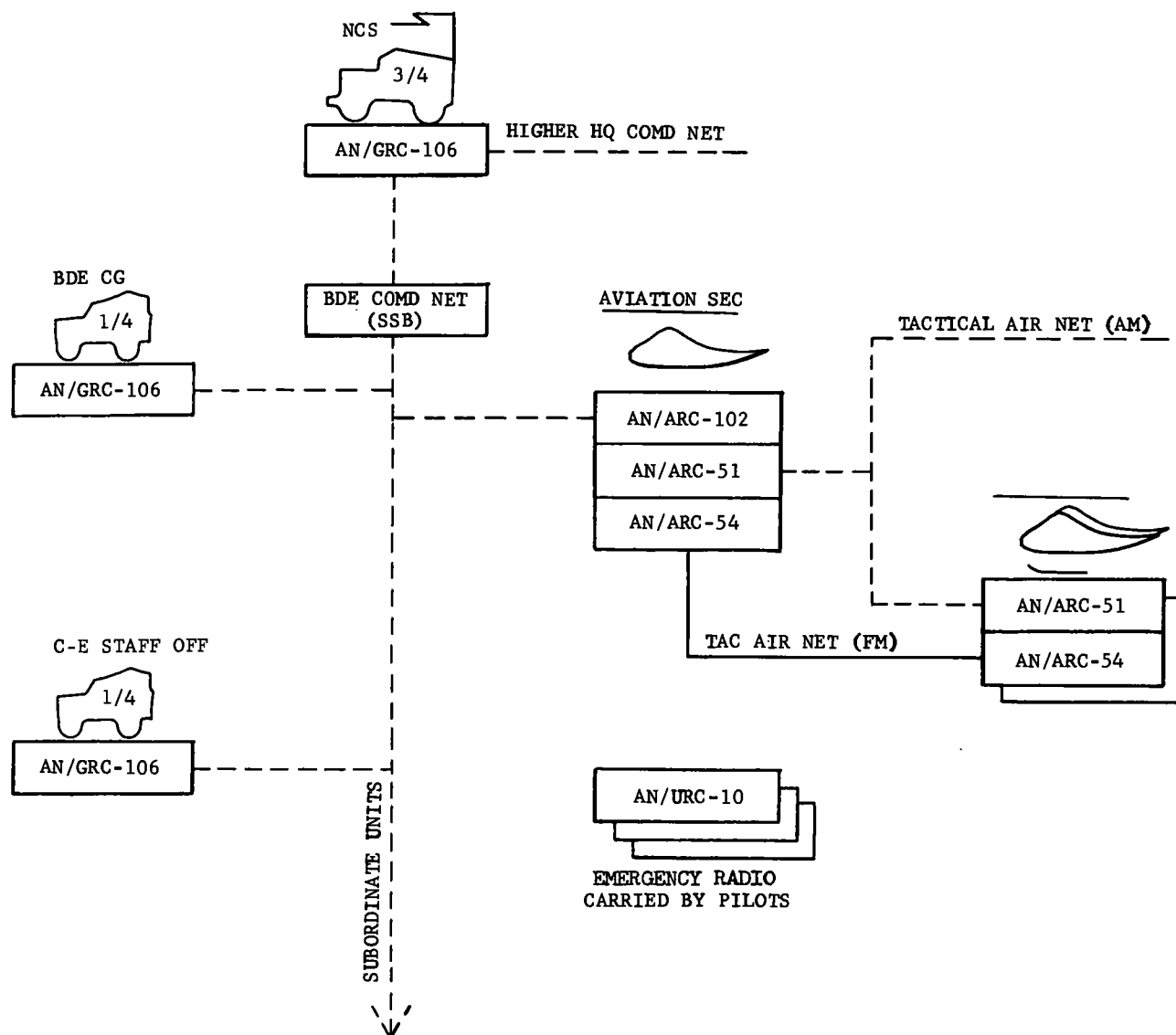
4-10. Major Items of Equipment

The equipment of headquarters and headquarters company, engineer brigade, is limited to individual equipment and that needed for housekeeping, local security, communications, air and ground transportation, and engineer control. Equipment needed for engineer control includes surveying, drafting, and reproduction equipment; reference texts; and laboratory sets for testing soils, concrete, and asphalt. For the major items of equipment of the component units of the construction brigade, see the discussion of the individual units.

4-11. Communications

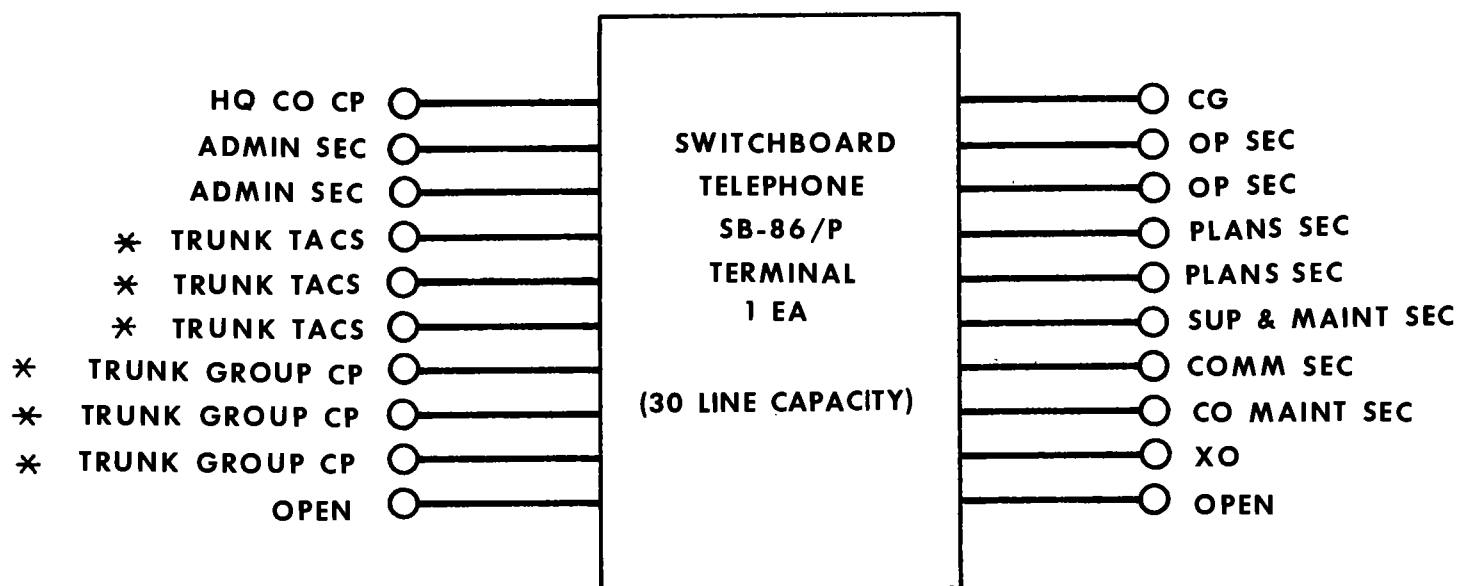
The engineer construction brigade has organic communications equipment which includes radios, teletypewriters, and telephone facilities. The radio net is shown in figure 4-2; the wire net, in figure 4-3. However, the brigade depends on the

area communications system for supplemental means of communicating with assigned units and higher and lateral commands. This supplemental communication will normally be installed, operated, and maintained by STRATCOM (theater) signal units which operate the theater army communications system (TACS) throughout COMMZ.



Note: The AN/ARC-51 Radios and the AN/ARC-54 Radios are issued with the helicopters. The AN/ARC-54 Radios are used for intercommunication between helicopters. The AN/ARC-102 is carried on the helicopter that carries the BDE CG and establishes an SSB Net with his staff and subordinates.

Figure 4-2. Radio net, engineer construction brigade.



* (ROUTED THROUGH AREA COMMUNICATIONS SYSTEM)

0 - FIELD TELEPHONE, TA-312

Figure 4-3. Wire net, engineer construction brigade.

CHAPTER 5

ENGINEER CONSTRUCTION GROUP

5-1. Mission

The mission of the engineer construction group is to perform engineer planning and design, and to command, plan, and coordinate the operations of assigned and attached engineer construction support units, and other units engaged in field construction, rehabilitation, or maintenance of facilities in support of Army or Air Force operations.

5-2. Assignment

This group normally is assigned to an engineer command, or an engineer construction brigade, or theater army support command (TASCOM).

5-3. Capabilities

a. Level 1. At level 1 this unit can—

(1) Control from three to five engineer construction battalions, and supporting engineer service units.

(2) Design, plan, and supervise the construction or rehabilitation of routes of communications, buildings, and installations, cargo and tactical airfields, heliports, limited petroleum storage and distribution facilities, and limited port and railroad facilities.

(3) Assign projects to subordinate units, allocate troops, and distribute and coordinate construction equipment and materials.

(4) Provide rotary-wing aircraft for support of reconnaissance and construction activities.

(5) Provide organizational maintenance and repair support for the unit's equipment.

(6) Supervise contract construction, contract labor, and indigenous hire personnel.

b. Levels 2 and 3. See paragraph 2-4a.

c. Type B Unit. As it is composed primarily of command and staff personnel, the headquarters and headquarters company, engineer construction group, is not adaptable to a type B organization.

d. Individuals of this organization, except chap-

lain, can engage in effective, coordinated defense of the unit's area or installation.

e. This unit depends on the medical detachment of higher headquarters or the medical detachments of assigned battalions for its unit medical support. It also depends on a personnel service company for personnel administration services and a finance support company for finance service.

5-4. Organization

Like the engineer brigade, the engineer construction group is a flexible organization and only becomes operational when working units are assigned or attached to it. The headquarters and headquarters company, engineer construction group, however, is a fixed organization and is organized under TOE 5-112 (fig. 5-1). It consists of two elements as follows:

a. Group Headquarters. Group headquarters consists of the commander, executive officer, S1, S3 (performs additional duties as S2), S4, chaplain, C-E staff officer, maintenance officer, and sergeant major.

b. Headquarters Company. Headquarters company consists of the personnel of a company headquarters and the operating sections of the group.

(1) *Company headquarters.* Company headquarters provides the command, administration, mess, supply, and organizational maintenance for the headquarters company.

(2) *Administrative section.* Supervised by the S1, this section provides the personnel required to process personnel management and related actions and administrative and classification actions.

(3) *Operations section.* Supervised by the S3, this section provides the personnel and equipment required to plan, design, and direct field construction or rehabilitation of facilities, buildings, heliports, and cargo and tactical airfields. This section is also involved to a limited degree with plans and

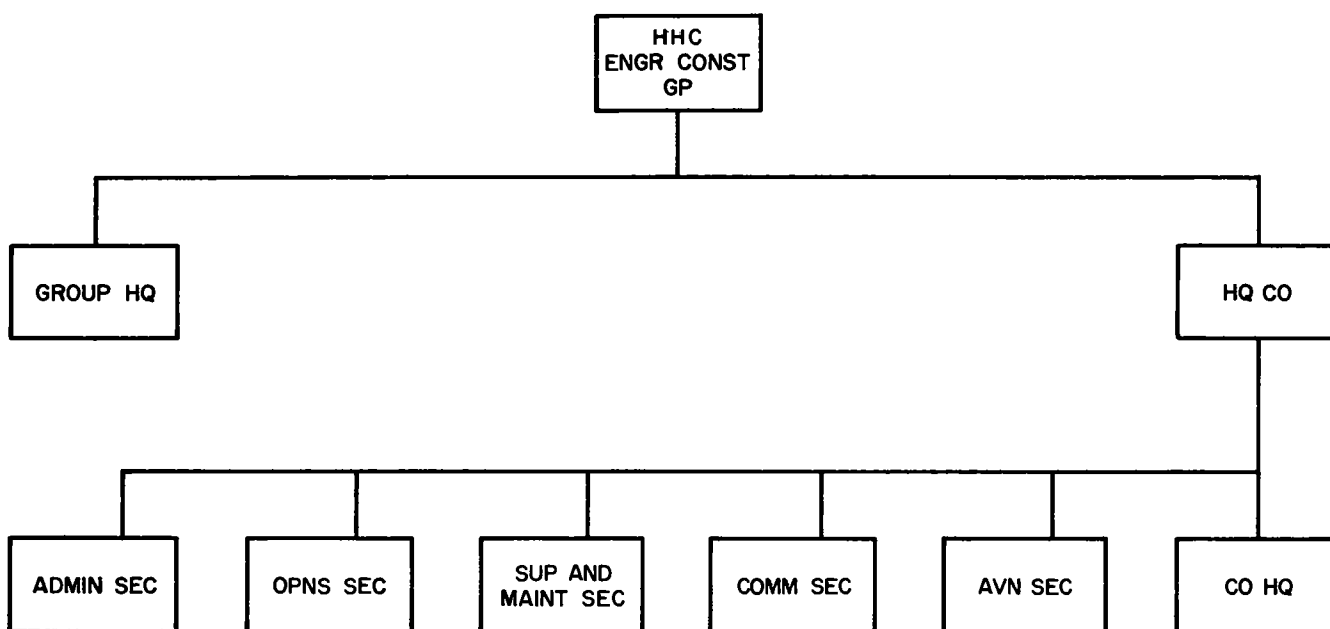


Figure 5-1. Organizational chart, headquarters and headquarters company, engineer construction group.

designs for petroleum storage and distribution facilities, and port and railroad facilities. As the S3 performs the additional duties of the S2 this section also handles all intelligence matters for the group.

(4) *Supply and maintenance section (S&M).* Supervised by the S4, this section provides the personnel and equipment to supervise and coordinate group supply and equipment maintenance activities. The maintenance officer is a staff member. His assistant and the equipment required for supervision of maintenance operations are included in this section. The food service technician is responsible for supervision of mess management within the group.

(5) *Communications section.* Supervised by the C-E staff officer, this section provides the personnel and equipment required to install, operate, and maintain a group communications system (radio and wire) and message center. This section is organized to operate on a 24-hour basis.

(6) *Aviation section.* Supervised by the aviation officer, this section provides the personnel and equipment required to provide rotary wing aircraft support to the group reconnaissance and construction activities.

5-5. Duties and Functions

Although its operations are on a smaller scale, the group resembles the brigade in organizational concept and in operations. The duties of the group

commander and his staff, and the personnel of the group sections, with some variations, are similar to their brigade counterparts. (See FM 5-1, FM 101-5, AR 611-101, AR 611-112, and AR 611-201.)

5-6. Basis of Allocation

Normally one per three to five engineer construction battalions, TOE 5-115.

5-7. Category

This unit is designated a category II unit. (See unit categories, AR 310-25.)

5-8. Mobility

Seventy-five percent mobile in organic equipment and 100 percent air transportable in medium transport aircraft.

5-9. Employment

a. The engineer construction group normally is given an area assignment in the communications zone by the engineer command or brigade to which it is attached. When required, mission-type assignments may also be accomplished in the field army area by the engineer construction groups of the communications zone.

b. Because of their flexible organization, groups can be employed in several ways: in conjunction with other construction groups within the brigade

on large-scale coordinated projects; independently on normal recurring tasks encountered in a typical theater of operations; or by the attachment of specialized teams or units to perform complex and specialized tasks. The operations section of the group has a capability for the planning and design of field construction. Work assignment may be designated by area, task, or a combination of the two—area-task (para 12-2).

c. The group and its assigned or attached units can perform all construction tasks required by an army in a theater of operations. These tasks include troop housing, road, bridge, railroad, pipeline, port, administrative facilities, airfield, and heliport construction. By the attachment of appropriate teams from TOE 5-530-series, the group also has a capability of reconstructing or rehabilitating municipal utility systems. The group may be given separate mission-type assignments. These may include construction of a port, construction of an airfield and related facilities, or interzonal tasks such as the construction of a theater pipeline or an inland waterway.

d. The number and types of construction and construction-support units assigned or attached to

the group are based on the mission of the group. As an example, if the group is given a port construction mission, one or more engineer port construction companies are attached to it. In like manner, if the group is given a mission to construct a pipeline, one or more engineer pipeline construction support companies are attached to it. Normally, however, there are three or more engineer construction battalions assigned or attached to the group.

5-10. Major Items of Equipment

The equipment of headquarters and headquarters company is limited to individual equipment and that needed for housekeeping, local security, communications, ground and air transportation, and engineer control. Engineer control equipment includes surveying, drafting, and reproduction equipment; reference texts; and laboratory sets for testing soils, concrete, and asphalt.

5-11. Communications

Signal communications equipment of the group includes radio, teletypewriter, and telephone facilities. The radio net is shown in figure 5-2 and the wire net is shown in figure 5-3.

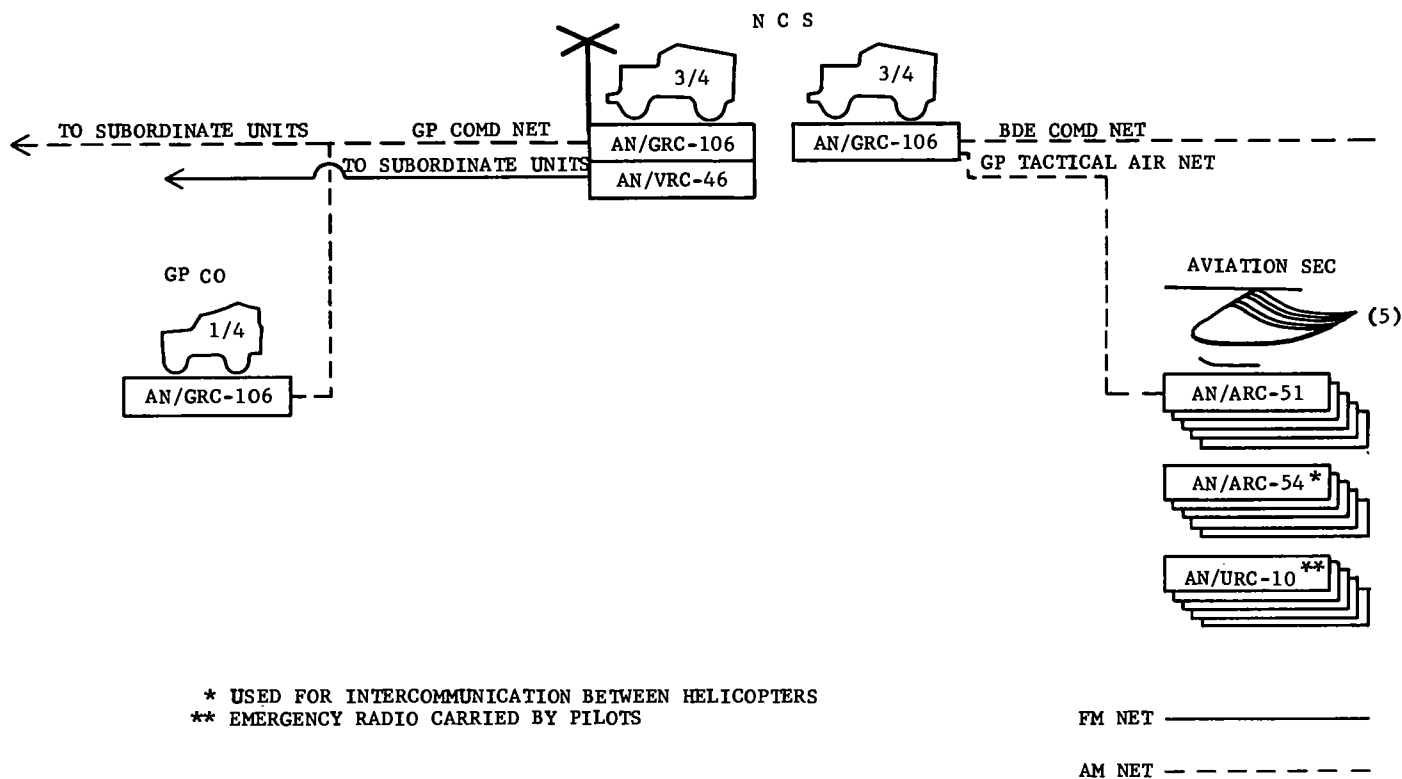


Figure 5-2. Radio net, engineer construction group.

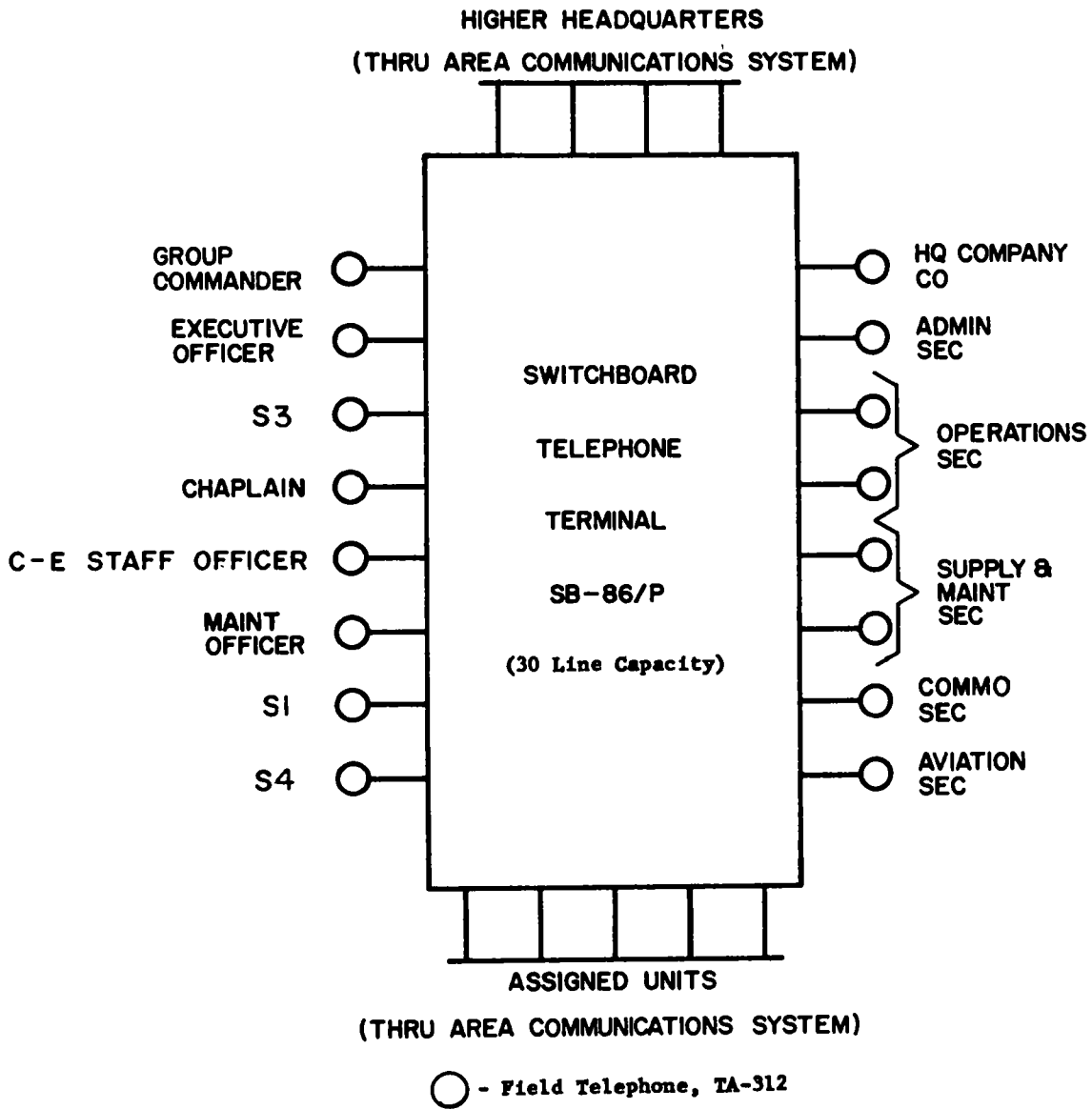


Figure 5-3. Wire net, engineer construction group.



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CHAPTER 6

ENGINEER CONSTRUCTION BATTALION

Section I. GENERAL

6-1. Mission

To construct and rehabilitate roads, airfields, pipeline systems, structures, and utilities for the Army and the Air Force in the communications zone and rear areas of the combat zone and to assist in emergency recovery operations.

6-2. Assignment

To the theater army for further assignment to the engineer command and to an engineer construction group.

6-3. Capabilities

a. Level 1. At level 1, this unit can provide—

(1) Construction or rehabilitation of routes of communications, bridges, forward tactical and cargo airfields, and heliports.

(2) General construction of buildings, structures and related facilities.

(3) Limited reconstruction of railroads, railroad bridges, and ports.

(4) Limited bituminous paving.

(5) Minor protective construction.

(6) Medical service for the battalion including emergency medical treatment, operation of the battalion aid station, evacuation of sick and injured personnel when practicable, and supervision of sanitation in the battalion.

(7) Supervision of contract construction, contract labor and indigenous personnel.

b. With Attachments. When supported by attachments of specialized personnel and equipment, the battalion provides—

(1) Large-scale bituminous and portland cement paving operations. (Engineer concrete mixing and paving teams, TOE 5-520.)

(2) Large-scale quarrying and crushing operations. (Engineer construction support company, TOE 5-114.)

(3) Major reconstruction of railroads and railroad bridges (TOE 5-114).

(4) Major rehabilitation of ports. (Engineer company, port construction, TOE 5-127, and dredge teams TOE 5-550.)

(5) Major protective construction (TOE 5-114).

(6) Construction of pipelines, storage tanks and related facilities. (Engineer pipeline construction support company, TOE 5-177.)

c. Levels 2 and 3. See paragraph 2-4a.

d. Type B Units. The type B column adapts this TOE to the lesser requirements for United States military personnel. Vacancies in the type B column indicate the types of positions that can be filled by non-United States personnel. The number of such personnel must be determined by the major commander to whom the unit is assigned and will depend on the capacity of available personnel to produce, the number of shifts worked, and other local conditions.

e. Individuals of this organization, except the chaplain and medical personnel, can engage in effective, coordinated defense of the unit's area or installation.

f. This battalion depends on a personnel service company for personnel administrative services and on a finance direct support company for finance services.

6-4. Organization

The engineer construction battalion (fig. 6-1) is organized under TOE 5-115, and consists of a headquarters and headquarters company, one engineer equipment and maintenance company, and three identical engineer construction companies.

6-5. Duties and Functions

The duties of the battalion commander and his staff and the functions of the staff sections are

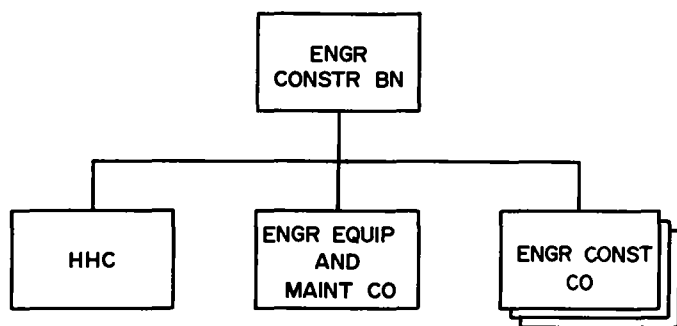


Figure 6-1. Organizational chart, engineer construction battalion.

outlined in FM 5-1, FM 101-5, AR 611-101, AR 611-112, and AR 611-201.

6-6. Basis of Allocation

Two to four per engineer construction group.

6-7. Category

This unit is designated a category II unit (AR 310-25).

6-8. Mobility

Eighty-seven percent mobile by organic transportation. This unit is 100 percent air transportable in heavy transport aircraft.

6-9. Employment

a. The engineer construction battalion may be employed independently as a unit; it may operate separately, assigned to the commander of the major force supported; or it may operate as an integral element of the engineer construction group. While the battalion is designed to function

as a unit under the command of the battalion commander, its organic construction companies may be temporarily detached for specific missions.

b. The battalion may be used in an area assignment where it is responsible for all construction activities within the area, or in a task assignment, or in a combination of both (para 12-2). When required, it may also operate in the field army area on a mission-type assignment.

c. When properly supported by attachments of specialized units or detachments from the construction group, the battalion can perform specialized heavy construction. It can do this when operating as a unit, or with the construction companies operating independently.

d. The battalion has a limited planning and design capability. It depends upon the group for any specialized planning and design. If the battalion is operating independently, and there is a demand for specialized planning and design, it must be augmented by the attachment of specialized personnel for these tasks.

6-10. Major Items of Equipment

For the major items of equipment in the construction battalion, see the discussions of the individual organic companies.

6-11. Communications

The construction battalion provides radios for communication between its headquarters and higher headquarters and its organic and attached units. Radio and telephone nets are also provided for communications between the various company headquarters and their operating elements (fig. 6-2 and 6-3).

Section II. HEADQUARTERS AND HEADQUARTERS COMPANY, ENGINEER CONSTRUCTION BATTALION

6-12. Mission

To provide command, planning, direction, coordination, and control of the engineer construction battalion and attached units.

6-13. Assignment

Organic to the engineer construction battalion, TOE 5-115.

6-14. Capabilities

a. Level 1. At level 1, this unit can—

(1) Provide command and staff functions for the battalion and attached units.

(2) Furnish administrative, supply, and medical services to units in the battalion.

(3) Perform ground reconnaissance and preliminary and final surveys for battalion projects.

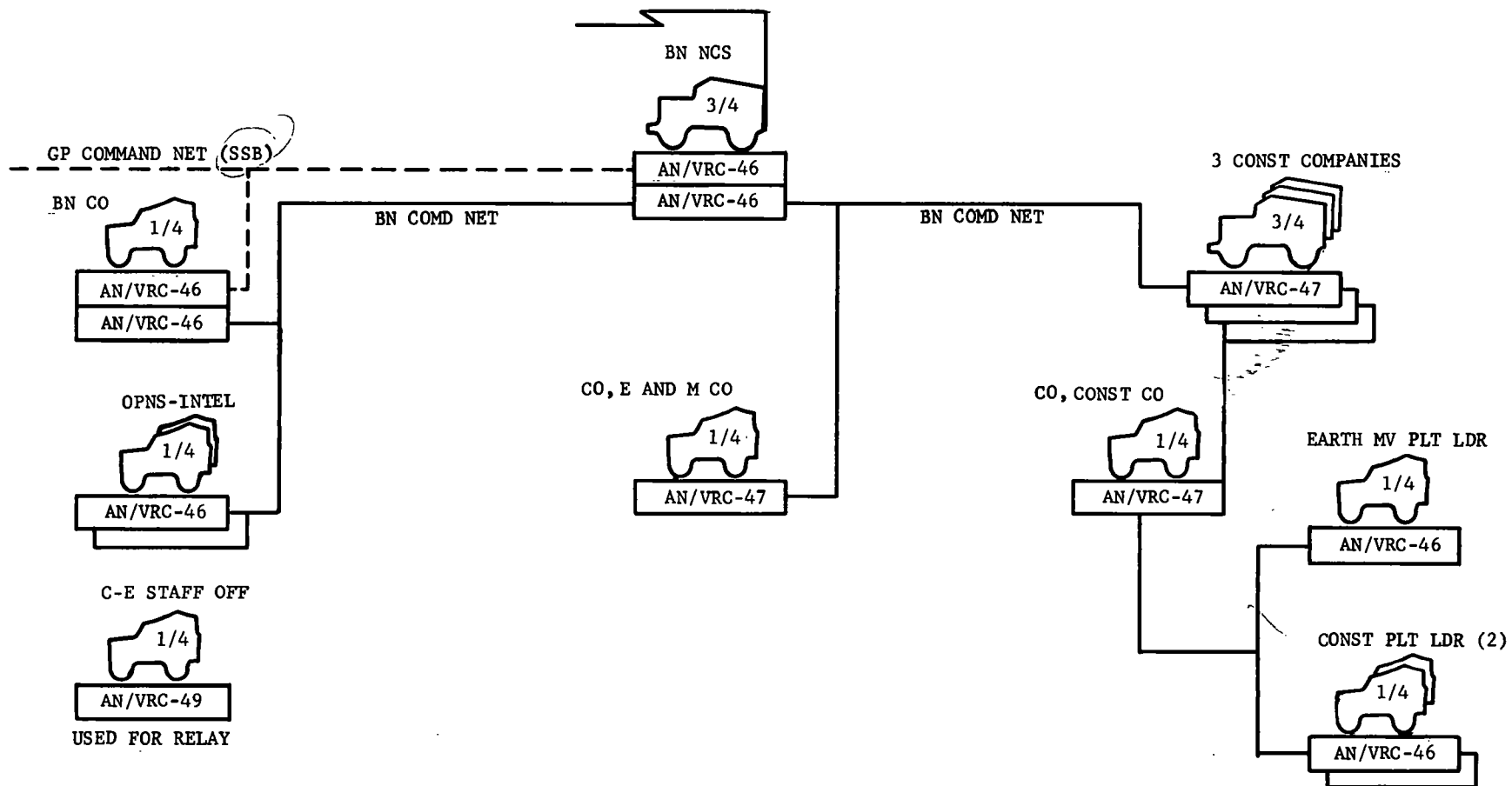


Figure 6-2. Radio net, engineer construction battalion.

(4) Provide design and detailed plans, construction layouts, site adaptations, and bills of material.

(5) Provide technical advice and direction, and furnish overall supervision for construction projects.

(6) Provide and supervise battalion communications and provide wire communications for subordinate units.

(7) Provide engineer intelligence for the battalion.

(8) Coordinate equipment requirements of the companies and effect temporary interchanges when operational requirements dictate.

(9) Furnish construction and utility specialists for special projects and for supervision of construction forces of the battalion, contract labor, or indigenous personnel.

(10) Provide two water points for supplying potable and nonpotable water in support of battalion construction operations and potable water for battalion units and for others as required.

(11) Provide administration, supply, organizational maintenance, and mess for the company.

b. Levels 2 and 3. See paragraph 2-4a.

c. Type B Unit. See paragraph 6-3d.

d. Individuals of this unit, except the chaplain

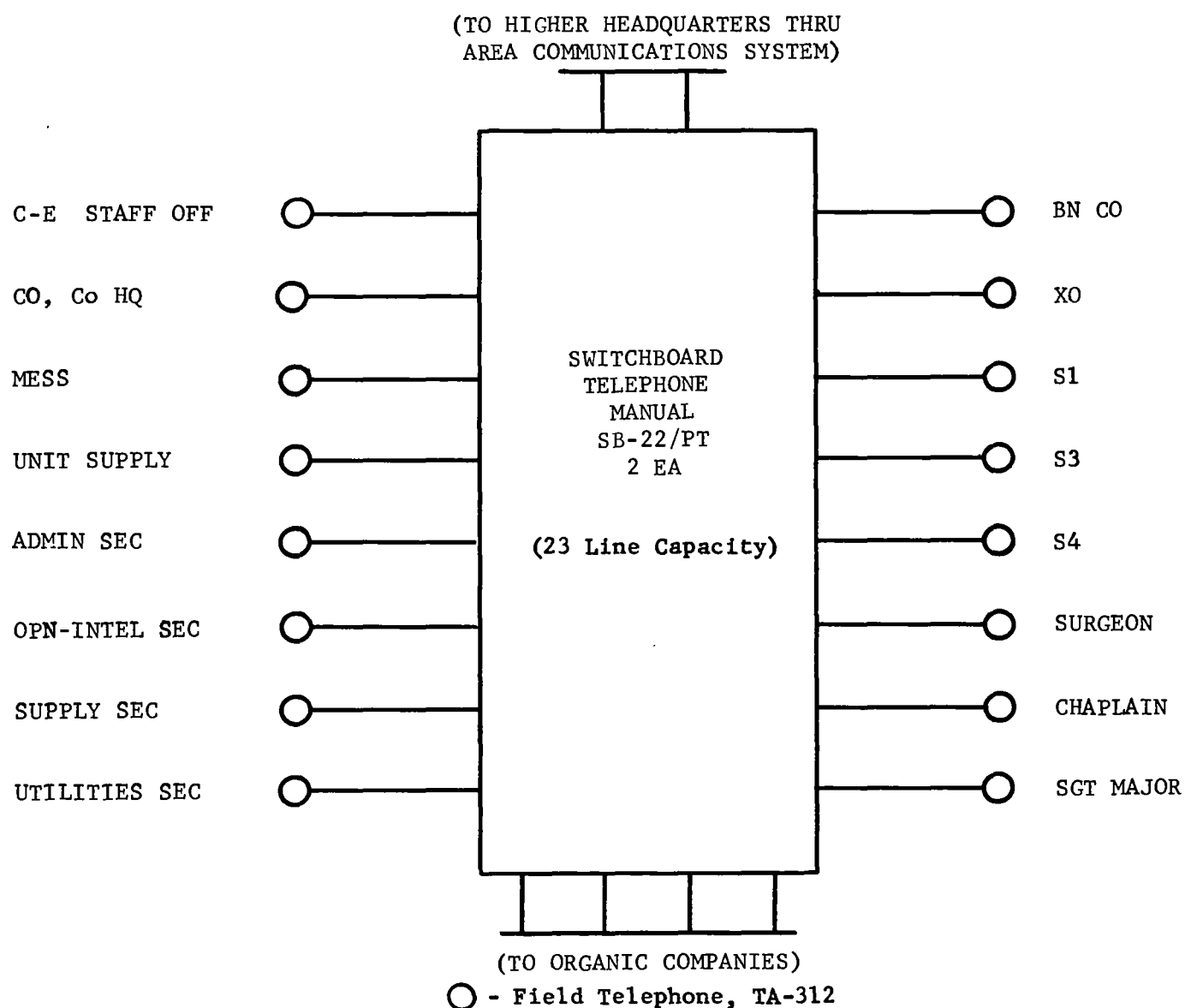


Figure 6-3. Wire net, engineer construction battalion.

and medical personnel, can engage in effective, coordinated defense of the unit's area or installation.

e. This unit depends on a personnel service company for personnel administrative services and a finance direct support company for finance services.

6-15. Organization

The headquarters and headquarters company, engineer construction battalion, is organized under TOE 5-116 (fig. 6-4) and consists of two elements as follows:

a. *Battalion Headquarters.* Battalion headquarters consists of a battalion commander, executive officer, S3, battalion surgeon, chaplain, engineer equipment maintenance officer, S1, S4, communications officer and sergeant major.

b. *Headquarters Company.* The headquarters company consists of a company headquarters and the personnel of the following operating sections of the battalion: administrative and personnel section; operations and intelligence section; supply section; communications section; utilities section; and medical section.

6-16. Duties and Functions

The duties of the battalion commander and his staff and the functions of the staff sections are outlined in FM 5-1, FM 101-5, AR 611-101, AR 611-112, and AR 611-201.

6-17. Basis of Allocation

One per engineer construction battalion, TOE 5-115.

6-18. Category

This unit is designated a category II unit (AR 310-25).

6-19. Mobility

Eighty-nine percent mobile and 100 percent air transportable in USAF medium transport aircraft.

6-20. Employment

The headquarters and headquarters company is employed in consonance with battalion operations to support construction efforts of either battalion or company size. Its mission is the same in either case.

6-21. Major Items of Equipment

The equipment of the headquarters and headquarters company is restricted to that needed for housekeeping, and such technical items as water purification sets, surveying sets, and asphalt, concrete, and soil testing sets used by personnel of the battalion staff sections.

6-22. Communications

See paragraph 6-11.

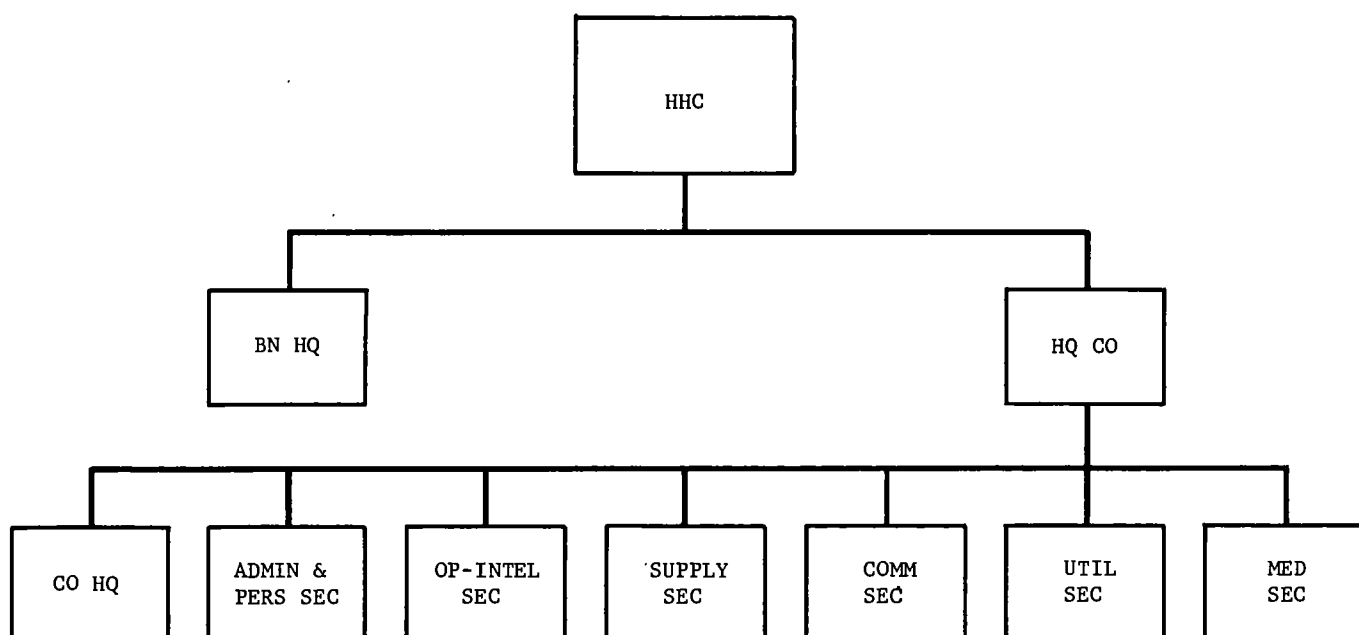


Figure 6-4. Organizational chart, headquarters and headquarters company, engineer construction battalion.

Section III. ENGINEER EQUIPMENT AND MAINTENANCE COMPANY

6-23. Mission

The mission of the engineer equipment and maintenance company is to support the engineer construction battalion with engineer direct support maintenance and to reinforce the construction capability of the battalion by providing construction specialists and equipment with operators.

6-24. Assignment

The engineer equipment and maintenance company is organic to the engineer construction battalion.

6-25. Capabilities

a. Level 1. At level 1 this unit can provide—

(1) Battalion level organizational maintenance of engineer construction and power generation equipment organic to the engineer construction battalion.

(2) Direct support maintenance for engineer construction and power generation equipment organic to the engineer construction battalion to include contact maintenance teams for job site repair.

(3) Repair parts required to support the battalion maintenance mission.

(4) Machine shop facilities.

(5) Equipment and specialist personnel to support the construction companies in bituminous operations.

(a) Dust palliation

(b) Surface treatment

(c) Penetration macadam paving

(d) Road mix paving

(e) Low type portable plant mix asphaltic concrete of three tons per hour.

(6) Aggregate production of 75 tons per hour on a 2-shift basis.

(7) Dump truck support to the construction companies or its organic crushing and asphalt equipment on a 2-shift basis.

(8) Engineer heavy equipment to reinforce the construction companies.

(9) Coordination for direct support maintenance for other than engineer construction and power generation equipment and all general support maintenance from a maintenance support company.

(10) The capability to supervise contract labor and indigenous personnel and to assist in the supervision of contract construction.

b. Levels 2 and 3. See paragraph 2-4a.

c. Type B Unit. See paragraph 6-3d.

d. Individuals of this organization can engage in effective coordinated defense of the unit's area or installation.

e. This unit depends on a personnel service company for personnel administrative services and a finance direct support company for finance services.

6-26. Organization

The engineer equipment and maintenance company is organized under TOE 5-117 (fig. 6-5) and consists of a company headquarters, an equipment platoon and a maintenance platoon.

6-27. Duties and Functions

The duties of the company personnel are outlined in AR 611-101, AR 611-112, and AR 611-201. The functions of the company headquarters and the two platoons are discussed briefly below.

a. Company Headquarters. Company headquarters consists of—

(1) A headquarters section, which provides the command, administration, mess and supply for the company.

(2) A company maintenance section, which provides organizational maintenance on automotive materiel and construction equipment for the company.

b. Equipment Platoon. The equipment platoon consists of—

(1) Platoon headquarters, which provides command and control of the platoon sections.

(2) Construction equipment section containing items of specialized equipment and operators employed in support of construction companies as required.

(3) Asphalt section, which furnishes personnel and equipment for bituminous surface treatment in support of individual construction company efforts.

(4) Rock processing and quarry section, which furnishes personnel and equipment for

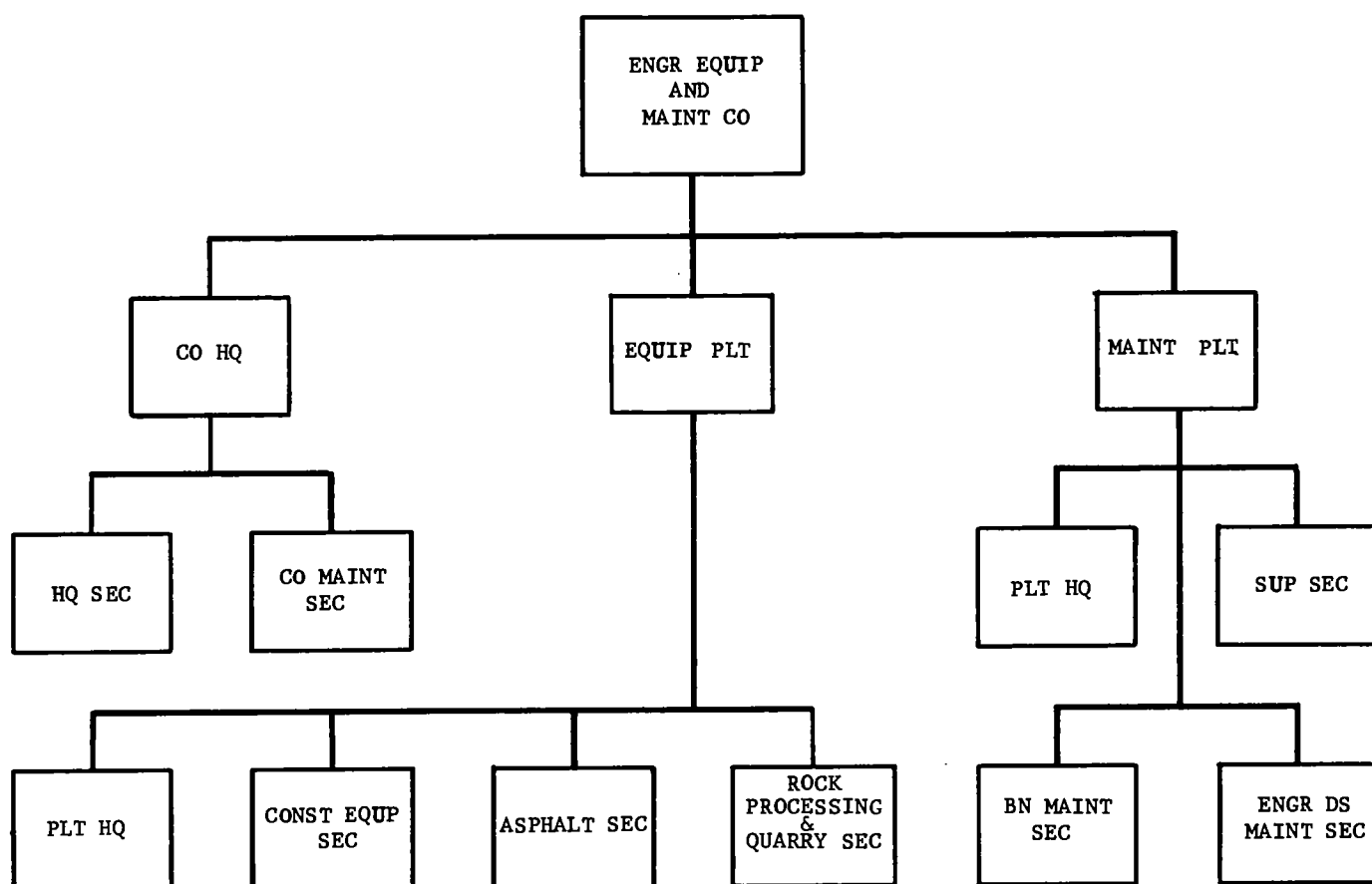


Figure 6-5. Organization chart, equipment and maintenance company, engineer construction battalion.

quarry and rock processing operations and production of aggregate in support of construction activities. The platoon may be augmented by an additional rock processing and quarry section depending on the type of rock drilling equipment issued.

c. Maintenance Platoon. The maintenance platoon consists of—

(1) Platoon headquarters, which provides command and control of the platoon sections.

(2) Engineer direct support maintenance section, which furnishes engineer equipment repairmen to perform direct support maintenance on all engineer equipment of the battalion, and contact maintenance teams for jobsite repair of engineer equipment.

(3) Battalion maintenance section, which furnishes personnel and equipment to provide the battalion with a full organizational maintenance capability by providing backup organizational maintenance support to the organic companies.

(4) Supply section, which provides personnel and equipment for requisitioning, maintaining

stock levels, and storing and issuing mission load repair parts for engineer equipment of the battalion. These parts include repair parts for the direct support maintenance of the maintenance platoon and for organizational maintenance units in the battalion.

6-28. Basis of Allocation

One per engineer construction battalion, TOE 5-115.

6-29. Category

This unit is designated a category II unit. (See AR 310-25.)

6-30. Mobility

Eighty-four percent mobile by organic transportation. This unit is 100 percent air transportable in heavy transport aircraft.

6-31. Employment

The engineer equipment and maintenance company is employed in support of the organic con-

struction companies of the construction battalion. It provides additional capabilities to those units by supplying specialized personnel and equipment, performing direct support maintenance for the battalion's organic engineer vehicles and equipment, and backup organizational maintenance for the entire battalion.

6-32. Major Items of Equipment

a. Company Headquarters. Equipment of company headquarters consists largely of individual items of equipment; items needed for housekeeping, communications, and administration; and the equipment required by the company maintenance section to perform organizational maintenance.

b. Equipment Platoon. The major items of equipment in the equipment platoon include an earth auger, crane shovels, ditching machines,

scoop loaders, a pneumatic tool and compressor outfit, dump trucks, bituminous material distributors, bituminous heating kettle, rollers, aggregate spreaders, a rotary sweeper, a compressor, a crushing and screening plant, full-tracked heavy tractors and generators.

c. Maintenance Platoon. The major items of equipment in the maintenance platoon consist of an organizational equipment repair shop, equipment maintenance contact shops, a semi-trailer repair parts shop, wreckers, a general purpose equipment repair shop, and generators.

6-33. Communications

The company is provided with a radio for access to the battalion radio net. Field telephones and a switchboard provide wire communications. Figure 6-6 shows the wire net of the company.

Section IV. ENGINEER CONSTRUCTION COMPANY

6-34. Mission

a. Excavate, haul, compact and grade earth and provide stabilized earth subgrades for airfields, roads, railroads, levees, supply storage areas and similar projects.

b. Construct and rehabilitate buildings, port facilities, bridges and drainage structures, pipelines and storage tanks, plus related facilities and install and repair utilities.

6-35. Assignment

Organic to the engineer construction battalion, TOE 5-115.

6-36. Capabilities

a. Level 1. At level 1 this unit can—

(1) Construct or rehabilitate theater of operations buildings, shelters, pipeline systems, and operational facilities and erect prefabricated structures.

(2) Install electric, water, and sewage facilities for theater of operations installations.

(3) Perform heavy general construction when supported with additional construction personnel and heavy equipment.

(4) Operate borrow pits and haul borrow pit material; perform cut and fill; compact natural or fill material to provide subgrades and base courses of specified bearing strength; and level natural or fill material to desired grades.

(5) Provide construction effort for bomb damage recovery operations.

(6) Provide its own administration, supply, mess, and organizational maintenance.

(7) Operate on a 2-shift basis.

(8) Supervise contract labor and indigenous personnel and assist in supervising contract construction.

b. Levels 2 and 3. See paragraph 2-4a.

c. Type B Unit. See paragraph 6-3d.

d. Individuals of this organization can engage in effective coordinated defense of the unit's area or installation.

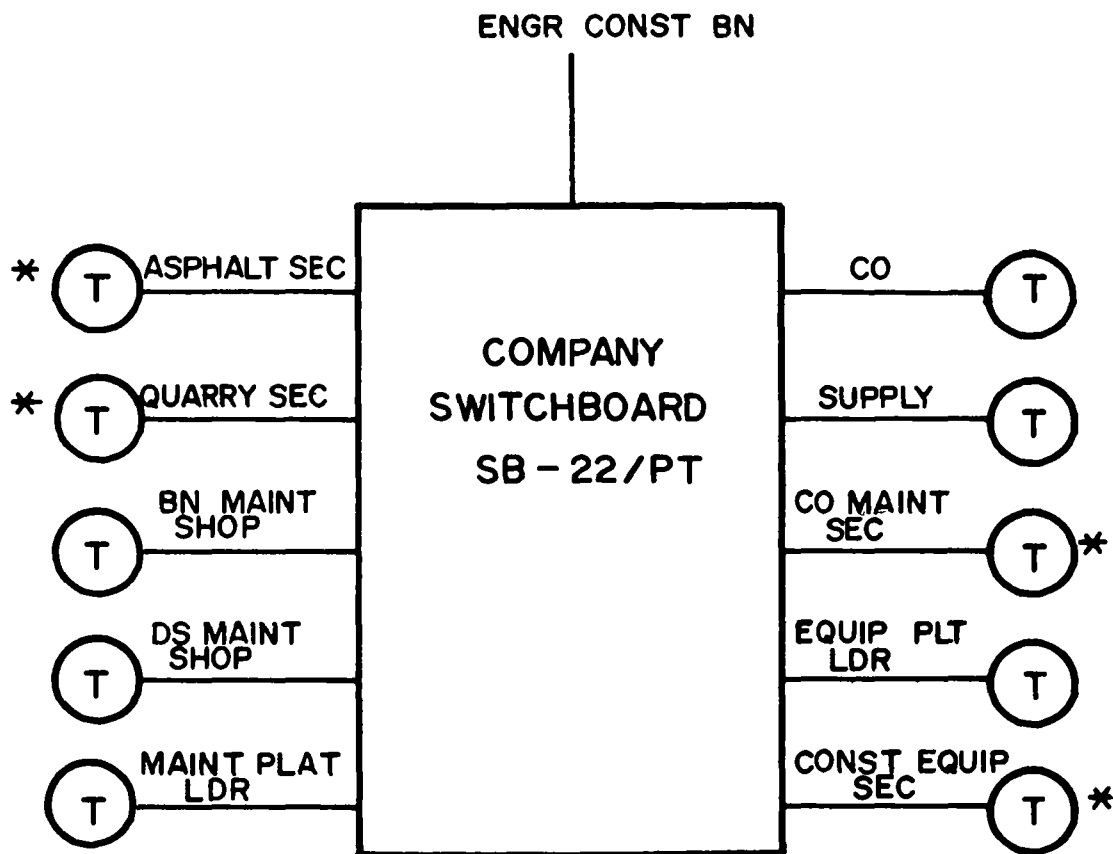
e. This unit depends on a personnel service company for personnel administrative services and a direct support company for finance services.

6-37. Organization

The engineer construction company is organized under TOE 5-118 (fig. 6-7) and consists of a company headquarters, an equipment maintenance section, an earthmoving platoon and two general construction platoons.

6-38. Duties and Functions

The duties of the company personnel are outlined in AR 611-101, AR 611-112, and AR 611-201. The functions of the company headquarters and the organic platoons are discussed briefly below.



* DOES NOT REQUIRE ACCESS TO COMMON USER SYSTEM

(T) TELEPHONE TA - 312 /PT

Figure 6-6. Wire net, equipment and maintenance company, engineer construction battalion.

a. The company headquarters provides command and administration, all supplies except repair parts, communications with organic platoons, and planning and supervision of company construction operations.

b. The equipment maintenance section performs organizational maintenance for organic engineer construction equipment and automotive equipment and vehicles, maintains dispatch and maintenance records, and maintains authorized repair parts stockage.

c. The earthmoving platoon consists of a platoon headquarters, a grading and compaction section, and an excavation and embankment section.

It performs drainage, grading, embankment, and excavation operations for roads, airfields, railroads, and area development.

d. Each of the two general construction platoons consists of a platoon headquarters and three general construction squads. They are used collectively or separately in support of the earthmoving platoon when it is engaged in clearing and grubbing, material handling, and the construction of drainage structures. They may also be used on general construction tasks such as construction or rehabilitation of buildings and similar facilities, bridges, pipelines, and storage tanks, and installation of related utilities.

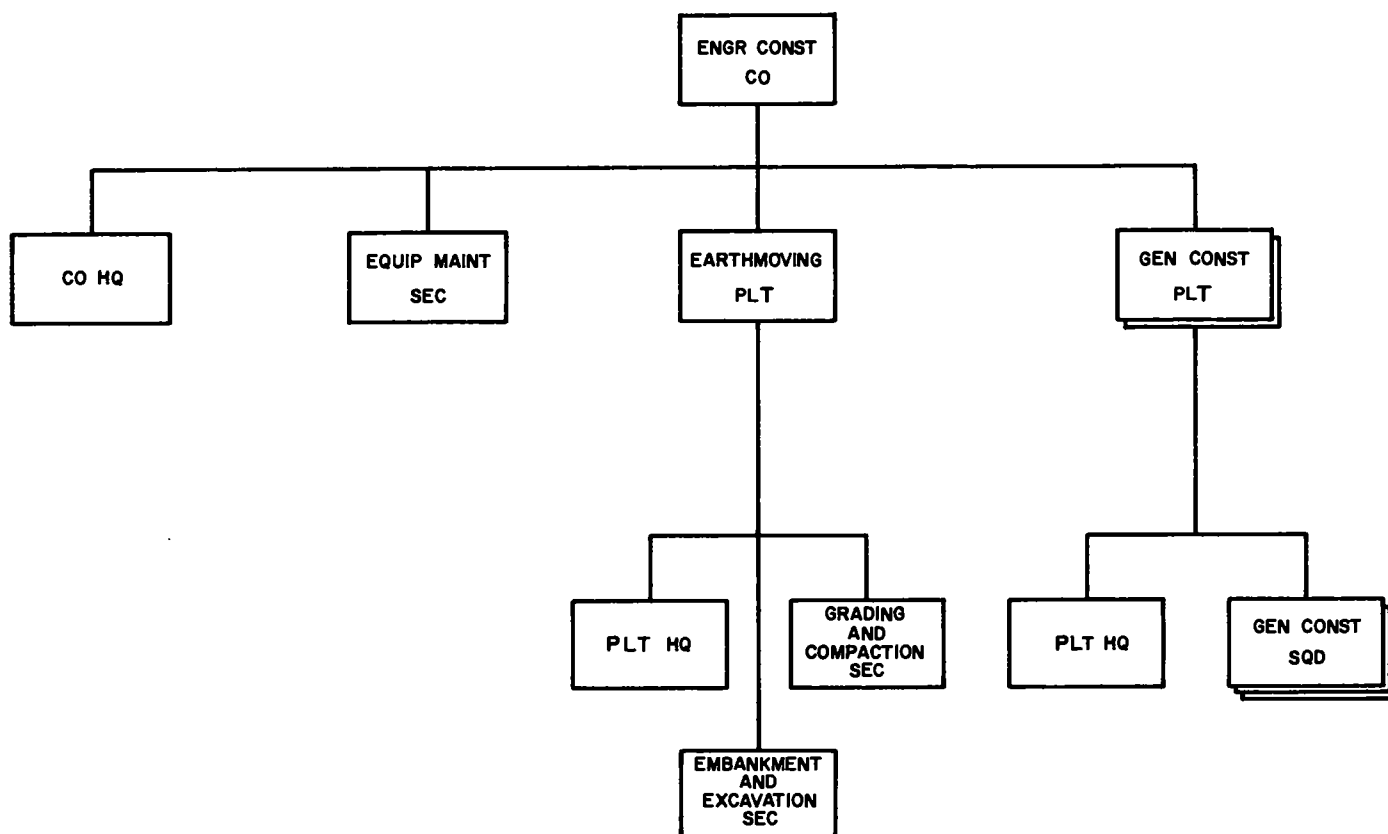


Figure 6-7. Organizational chart, construction company, engineer construction battalion.

6-39. Basis of Allocation

Three per engineer construction battalion, TOE 5-115.

6-40. Category

This unit is designated a category II unit (AR 310-25).

6-41. Mobility

Eighty-seven percent mobile by organic transportation. This unit is 100 percent air transportable in heavy transport aircraft.

6-42. Employment

The basic work unit of the engineer construction battalion—the engineer construction company—is organized for 2-shift operations in all necessary functions including mess, construction equipment operations, and vehicles (dump trucks). It may be used as an integral part of the battalion on large projects or as a separate unit on company-size projects. When performing specialized construc-

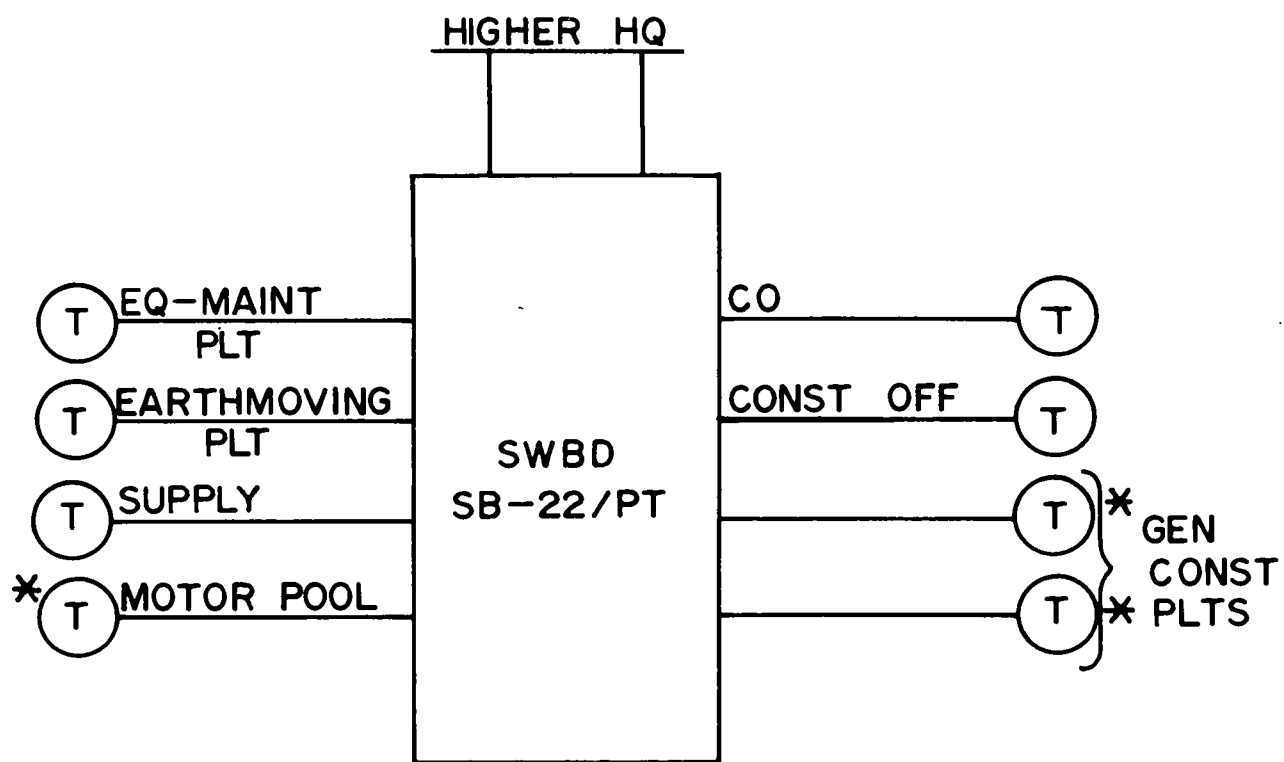
tion tasks, this company may be augmented by personnel and equipment from supporting elements.

6-43. Major Items of Equipment

The major items of equipment of the engineer construction company include a trailer, mounted welding shop, 18-cubic yard scrapers, dump trucks, full-tracked and rubber-tired tractors with dozer blades, scoop loaders, water distributors, graders, rollers, crane shovels, concrete mixers, pneumatic tool and compressor outfits, floodlight sets, and portable electric pioneer tool outfits.

6-44. Communications

The company is provided with radios for access to the battalion radio net and for communications between the company commander and the three platoon leaders (fig. 6-2). Field telephones and a switchboard provide wire communication between the operating elements of the company and to battalion. Figure 6-8 shows the wire net of the company.



(T) TELEPHONE TA-312/PT

* DOES NOT REQUIRE ACCESS TO COMMON USER SYSTEM

Figure 6-8. Wire net, construction company, engineer construction battalion.



Figure 6-9. Members of an Engineer Construction Battalion placing fill for a main supply route.

CHAPTER 7

ENGINEER COMPANY, PORT CONSTRUCTION

7-1. Mission

To perform special engineering work involved in providing port, beach, and POL facilities in support of military operations.

7-2. Assignment

Normally assigned to the engineer command, TOE 5-201, or an engineer construction brigade, TOE 5-111.

7-3. Capabilities

a. Level 1. At level 1 this unit can—

(1) Operate in conjunction with other engineer units in performing specialized tasks in the construction and complete rehabilitation of port facilities and construction of beach facilities.

(2) Operate in conjunction with other engineer units in the installation or rehabilitation of tanker off-loading facilities to include submarine pipelines and limited construction or rehabilitation of onshore POL storage facilities.

(3) Perform organizational maintenance of organic automotive equipment and organizational and direct support maintenance of organic construction, marine, and power generation equipment.

(4) Perform 2-shift operations.

(5) Provide the capability for supervision of contract labor and indigenous hire personnel, and for assistance in the supervision of contract construction.

b. Level 2 and 3. See paragraph 2-4a.

c. Type B Unit. The capabilities of a type B organization are the same as those of a level 1 organization.

(1) The type B organization adapts this unit to the lesser requirements for US military personnel. Existing vacancies indicate the types of positions that can be filled by non-United States personnel. The number of such personnel must be determined by the major commander to whom the

unit is assigned and will depend upon the capacity of available personnel to produce, the number of shifts worked, and other local conditions.

(2) Interpreters and translators required when the unit is organized as a type B unit will be provided from appropriate teams available to the theater commander.

d. Individuals of this organization can engage in effective, coordinated defense of the unit's area or installation.

7-4. Organization

The engineer company, port construction is organized under TOE 5-129 (fig 7-1). It consists of a company headquarters, two construction platoons, and a service platoon.

7-5. Duties and Functions

The duties of the company personnel may be found in AR 611-101, AR 611-112, and AR 611-201. The functions of the company headquarters and the organic platoons are discussed briefly below.

a. The company headquarters is divided into—

(1) Headquarters section, which provides command, administration, and mess on a 2-shift basis.

(2) Operations section, which maintains control over construction projects by inspecting and assisting the company commander in his supervision; prepares construction plans, charts, and diagrams; performs limited survey missions; and maintains records of work efforts, materials used or needed, and other information pertinent to the construction effort.

(3) Supply section, which provides organizational and operational supplies, equipment, and parts for the company.

(4) Diving section, which provides the company with an underwater inspection, demolition, and construction capability.

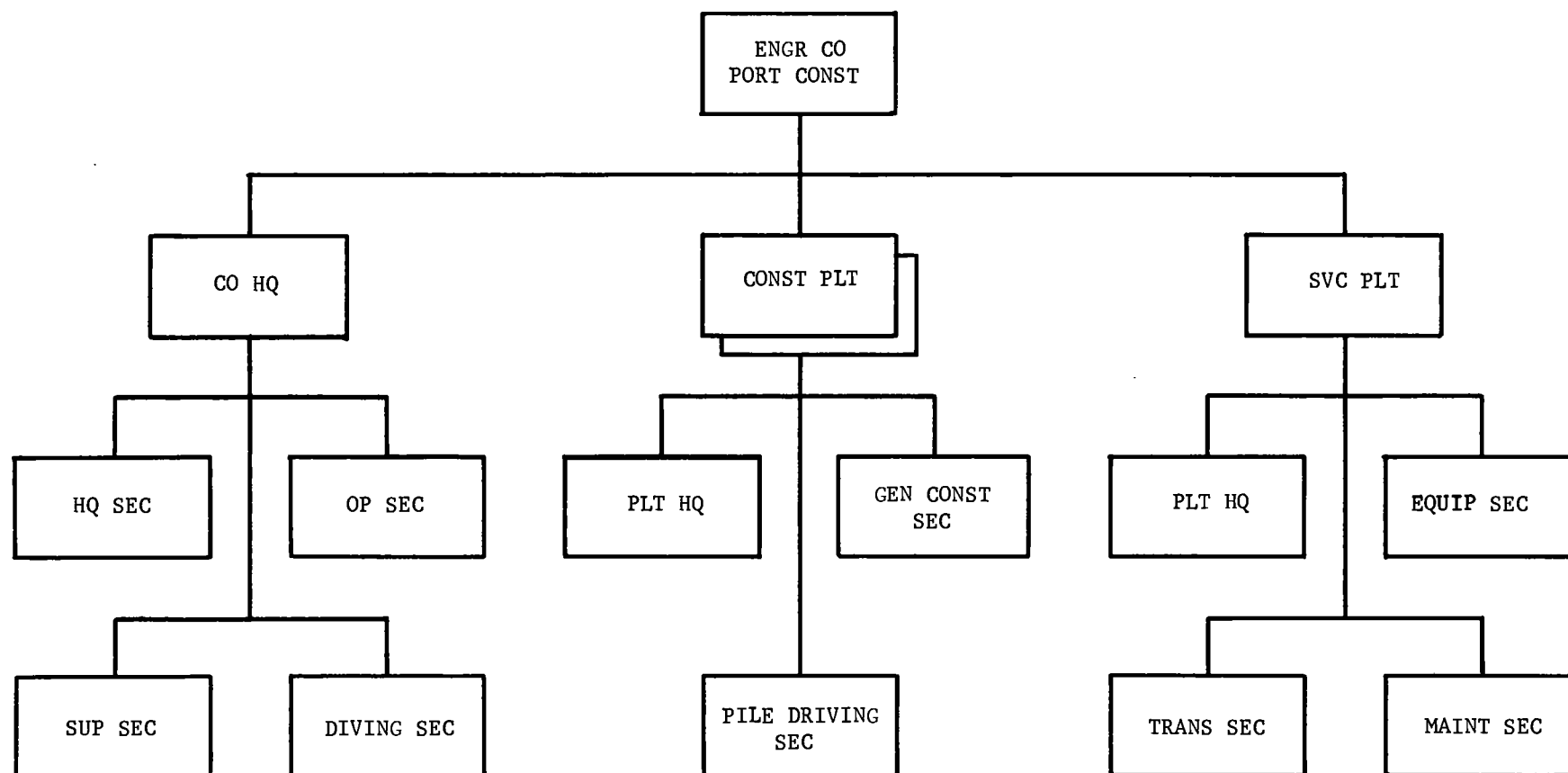


Figure 7-1. Organizational chart, engineer company, port construction.

b. Two construction platoons, each composed of—

(1) Platoon headquarters, which directs the operations of the platoon.

(2) A general construction section, which is employed in general construction duties in connection with port construction including submarine pipeline and POL terminal construction.

(3) A pile-driving section, which operates the pile-driving equipment used in the construction of piers, quays, slips, and other facilities requiring piling.

c. Service platoon, consisting of—

(1) Platoon headquarters, which directs the operations of the platoon.

(2) Maintenance section, which performs organizational maintenance on organic automotive and engineer equipment and direct support maintenance on organic engineer equipment for the company.

(3) Equipment section, which operates specialized engineer equipment in support of the construction platoons.

(4) Transportation section, which provides and operates the wheeled vehicles needed in support of the company.

7-6. Basis of Allocation

One per engineer construction brigade, TOE 5-111, or one per engineer construction group, TOE 5-112.

7-7. Category

This unit is designated a category III unit (AR 310-25).

7-8. Mobility

Fifty percent mobile by vehicle when LCM's and cube barges are excluded. One hundred percent mobile under conditions favoring concurrent land and water movement.

7-9. Employment

a. The company's activities are normally located in the communications zone. On occasion, however, the company may function within the field army area (combat zone), particularly when working on inland waterway ports or during the early stages of construction and rehabilitation of port facilities before a communications zone is established. It normally operates as one element

of a large-scale, coordinated construction operation under an engineer group or engineer brigade, although at a relatively detached location and in a comparatively independent manner.

b. The activities of the engineer company, port construction are mainly limited to the construction or major repair of waterfront structures and POL off-loading facilities and anchorages. Typical structures are offshore moorings, piers, quays, slips, locks, drydocks, jetties, cargo-handling facilities, marine railways, and harbor craft repair facilities. POL facilities work includes launching and anchoring, welding submarine pipelines and installing (and in some cases fabricating) anchors and pipeline buoys. Any major construction or rehabilitation of onshore POL storage facilities (including storage tanks) should be accomplished by other engineer construction units. While the port construction company may be employed on waterfront railyards, roads, hardstands, and covered storage, these projects are more appropriately assigned to engineer construction battalions.

c. For large scale operations or work involving more equipment than is organic to the company, the company may have to be supplemented by other engineer construction units or by civilian labor and equipment. It is preferable to assign related onland subprojects to a construction battalion and let the port construction company handle the specialized waterfront construction rather than attach a port construction company to a construction battalion that is not familiar with the special techniques of waterfront and harbor work.

d. The company can do a limited amount of dredging with its 2-cubic-yard crane mounted on barge assembly sets. For extensive underwater excavation, floating dredges (TOE 5-550) should be used.

e. Construction platoons, augmented as necessary with divers, equipment, and ship personnel, are capable of independent operation when given administrative support such as mess, supply, and maintenance. Appropriate platoon projects are rehabilitation of small ports or construction of POL tanker anchorages and off-loading facilities.

7-10. Major Items of Equipment

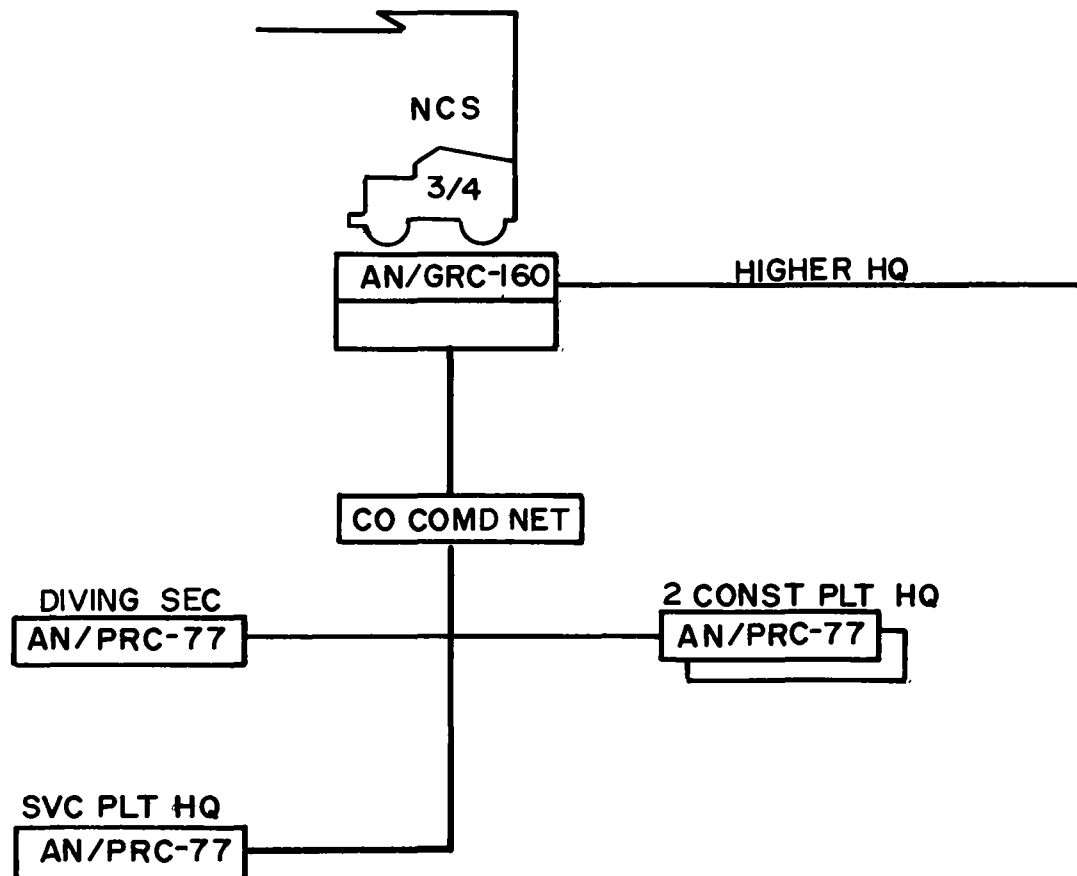
The major items of equipment of the engineer company, port construction include diving equipment; pipeline equipment; crane-shovels with attachments for dredging, excavating, pile driving and other work; hydraulic jacks; compressors;

pumps; tractors; concrete mixers; barge assembly sets; diesel-powered outboard propelling units; and landing craft mechanized (LCM).

7-11. Communications

Communications to higher or adjacent units is by

telephone where wire tie-in is provided by signal units. Internal communication is by radio and telephone. The two LCM organic to the unit are equipped with SRC-8 radios for communicating with each other. The company radio net is shown in figure 7-2, the wire net, in figure 7-3.



NOTE: TWO LCM WITH SRC-8 RADIOS ORGANIC TO THE UNIT

Figure 7-2. Radio net, engineer company, port construction.

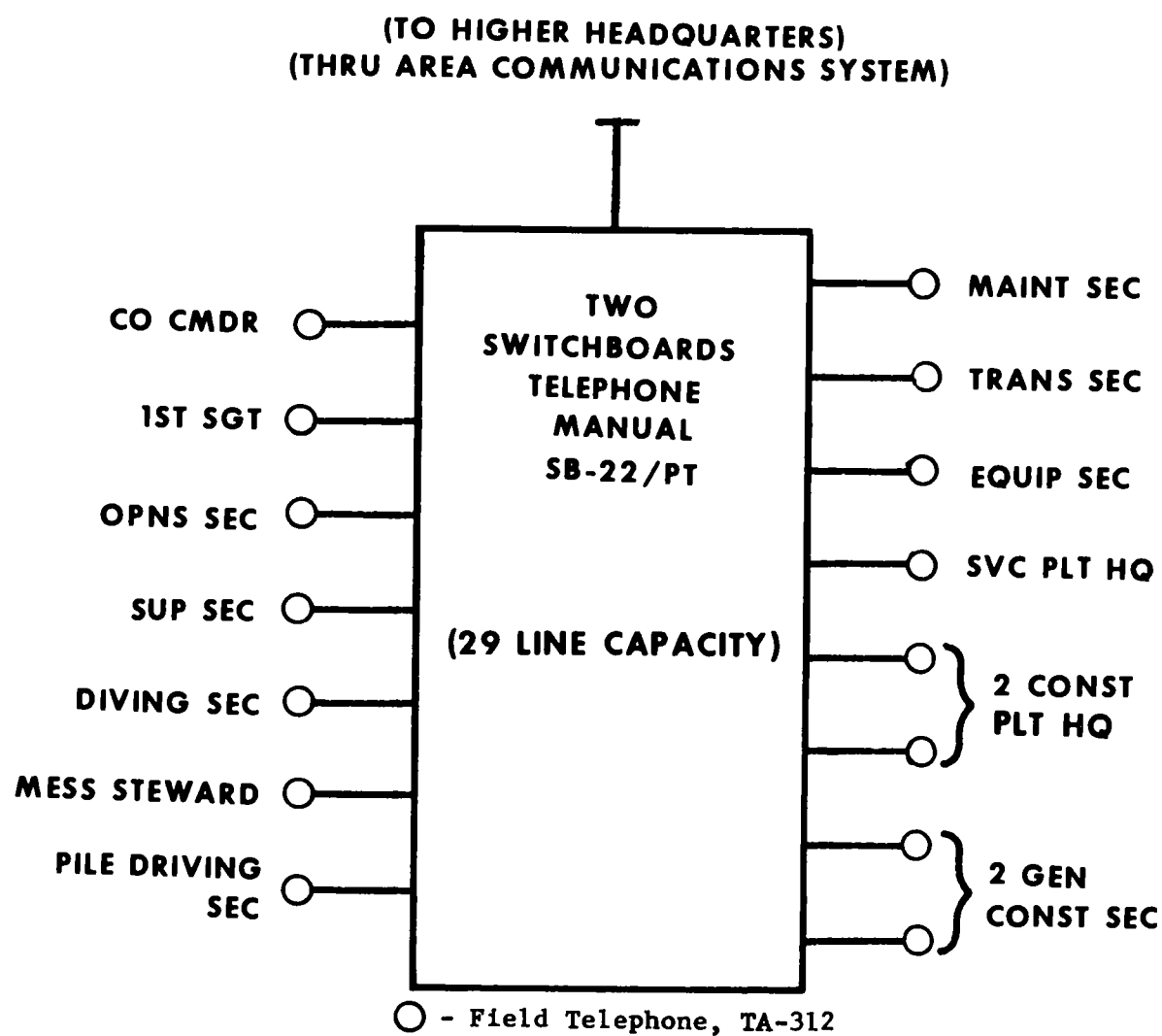


Figure 7-3. Wire net, engineer company, port construction.

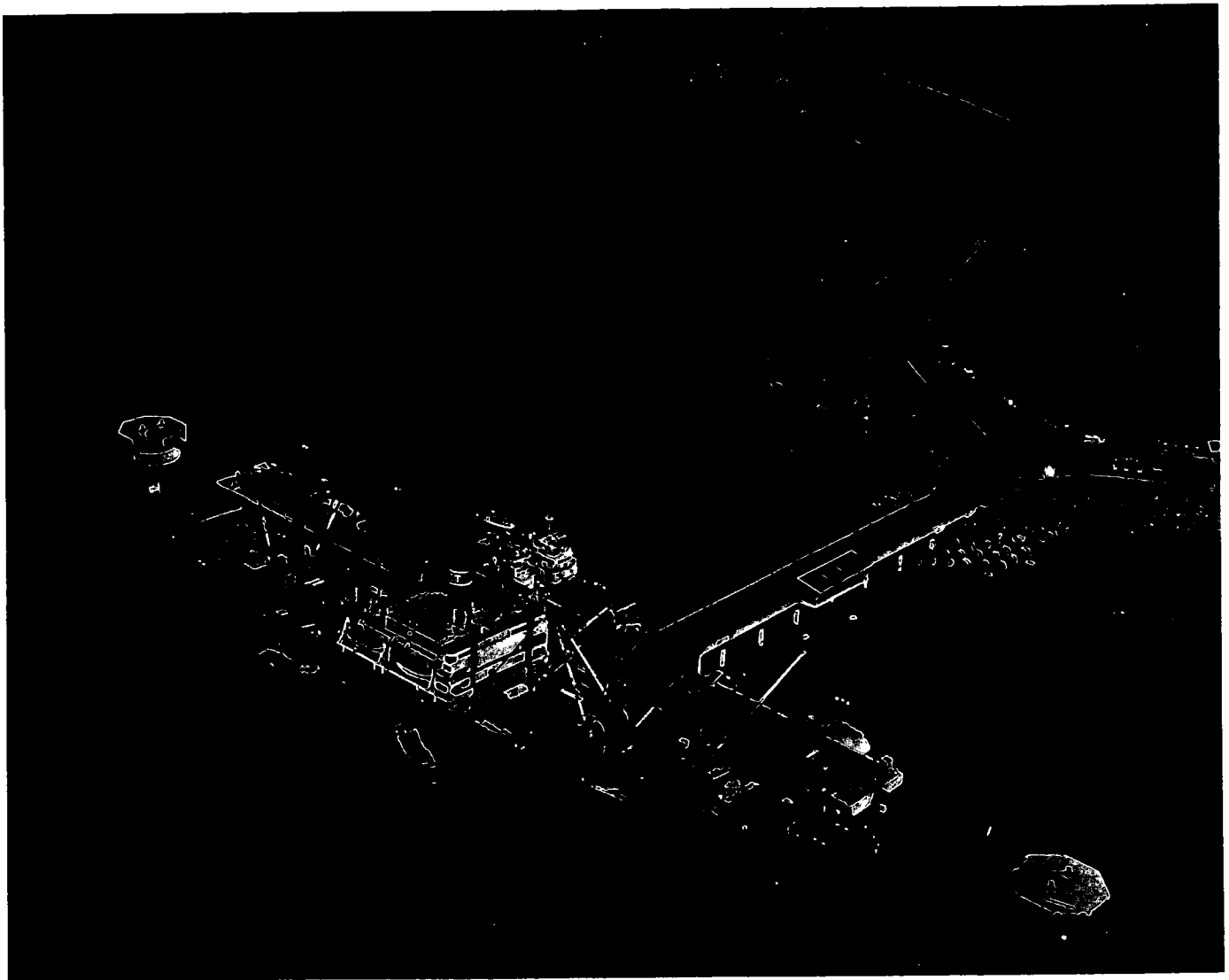


Figure 7-4. Cargo offloading facility typical of the type which may be constructed by an engineer company, port construction.

CHAPTER 8

ENGINEER CONSTRUCTION SUPPORT COMPANY

8-1. Mission

To provide rock crushing, bituminous mixing, paving and other construction support equipment with operators; to increase the capabilities of the construction group in major horizontal construction projects such as highways, storage facilities, and aircraft landing facilities.

8-2. Assignment

Normally assigned to the engineer command, with further assignment to an engineer construction group, TOE 5-112.

8-3. Capabilities

a. Level 1. At level 1 this unit can—

(1) Operate in support of an engineer group engaged in construction projects.

(2) Provide a rated capacity of 75 tons per hour of crushed rock and sand from rock quarries and gravel pits or the same quantity of washed and sized precrushed rock.

(3) Provide 120 tons per hour of bituminous mixes and blends for paving operations.

(4) Provide equipment with operators to support construction operations (less bituminous) on 2-shift basis.

(5) Provide equipment and personnel to conduct quarrying operations on a 2-shift basis.

(6) Provide equipment and technical personnel for 1-shift bituminous paving operations.

(7) Perform organizational maintenance for all organic equipment, and direct support maintenance for organic engineer equipment.

(8) Provide construction and utility personnel support for special projects, supervisions of the construction forces on the company, contract labor, or indigenous personnel.

b. Levels 2 and 3. See paragraph 2-4a.

c. Type B Unit. This unit is adaptable to a type B organization. The capabilities of a type B organization are the same as those of a full

strength organization. The type B column adapts the TOE of this unit to the lesser requirements for United States military personnel. Existing vacancies indicate the types of positions that can be filled by non-United States personnel. The number of such personnel must be determined by the major commander to whom the unit is assigned and will depend upon the capacity of available personnel to produce, the number of shifts worked, and other local conditions. Interpreters and translators required under the type B organization will be provided from appropriate teams available to the theater commander.

d. Individuals of this organization can engage in effective, coordinated defense of the unit's area or installation.

8-4. Organization

The engineer construction support company consists of a company headquarters and four specialized operating platoons and is organized under TOE 5-114 (fig. 8-1).

8-5. Duties and Functions

The duties of the company personnel are outlined in AR 611-101, AR 611-112, and AR 611-201. The functions of the company headquarters and the organic platoons are discussed briefly below.

a. Company headquarters contains the personnel and equipment required to command and control the unit and provide administration, mess, supply, and communication support to the company.

b. The equipment platoon supports the operations of the quarrying and processing platoon, the asphalt platoon, and other construction units by providing heavy cranes and tractors with operators; it also provides heavy pile-driving equipment and operators in support of construction units engaged in pile-driving operations.

c. The maintenance platoon contains the personnel and equipment required to perform organiza-

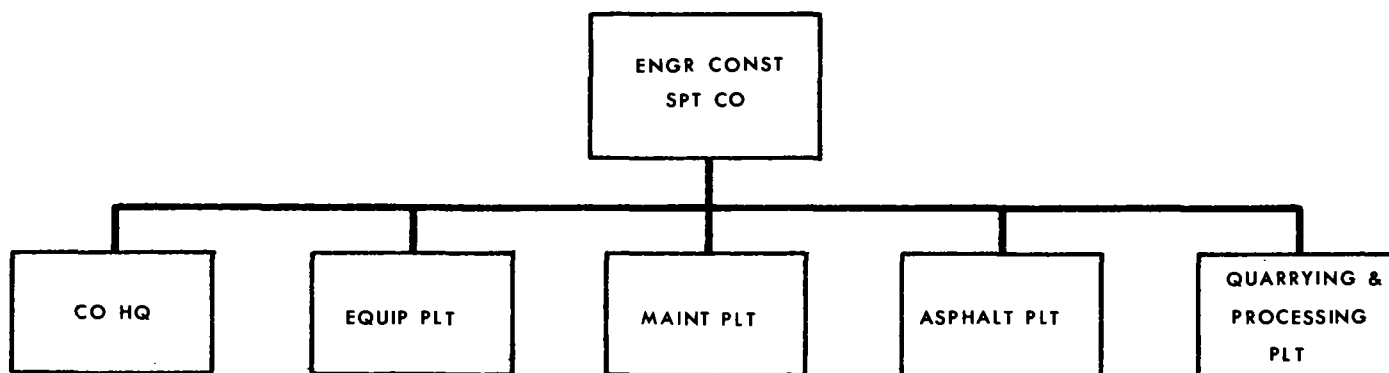


Figure 8-1. Organizational chart, engineer construction support company.

tional and limited direct support maintenance on organic engineer equipment. The direct support maintenance function has the capability to accomplish repairs on the jobsite in order to keep the equipment deadline rate at a minimum and avoid evacuating hard-to-move heavy construction equipment to a shop for repairs. In addition, the maintenance platoon recovers and evacuates disabled vehicles and equipment; requisitions, stores, and maintains the authorized allowance of repair parts and maintenance repair parts records; and provides for administrative control of all company vehicles and engineer mechanical equipment.

d. The asphalt platoon supports construction units engaged in bituminous paving operations by providing asphalt technicians and equipment with operators.

e. The quarrying and processing platoon establishes and operates quarries for the production of aggregate in support of construction units requiring such material.

8-6. Basis of Allocation

One per engineer construction group, TOE 5-112.

8-7. Category

This unit is designated a category II unit (AR 310-25).

8-8. Mobility

Approximately 50 percent mobile with organic transportation.

8-9. Employment

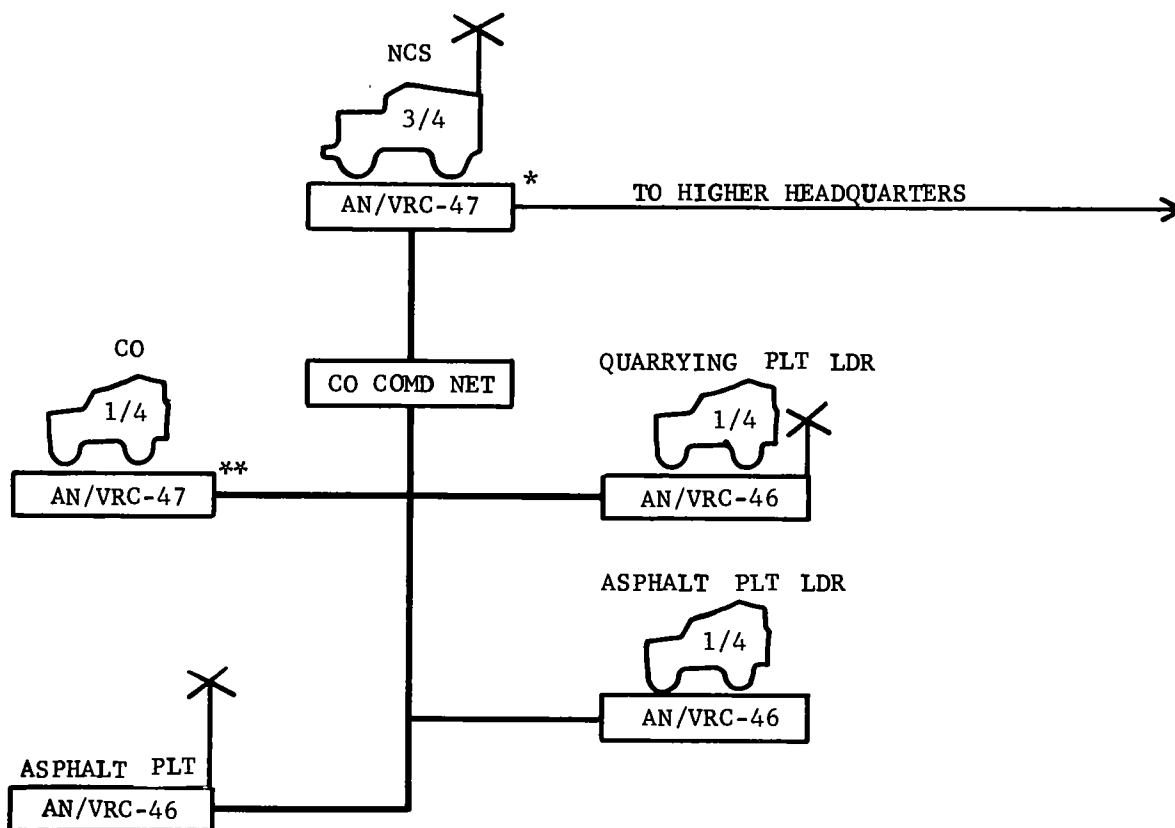
The engineer construction support company will be employed by the engineer group to increase the construction capabilities of organic battalions requiring coarse and fine aggregate for road and airfield construction and for concrete production, mixed bituminous materials for paving projects, and heavy equipment with operators for hauling, loading, grading, digging, and shoveling operations beyond the capabilities of the battalions. This unit will normally operate asphalt equipment in more than one location at the same time.

8-10. Major Items of Equipment

Major items of equipment include full-tracked medium tractors, rotary air compressors, crane-shovels, ditching machines, piledrivers, pneumatic tool outfits, wheeled tractors, a general-purpose repair shop, a contact equipment maintenance shop, an asphalt mixing and paving set, bituminous material tank distributor, 60 ton trailers, rollers, aggregate spreaders, rotary sweepers, generators, aggregate storage bins, a crushing and screening plant, a washing and screening plant, rock-drilling equipment, and dump trucks.

8-11. Communications

The engineer construction support company has been provided with the minimum essential equipment required to permit internal radio and wire communications and to communicate with supported units and the next higher headquarters. Figure 8-2 shows the company radio net; figure 8-3, the company wire net.



* NET CONTROL STATION OPERATES IN THE COMPANY NET, MONITORS THE HIGHER HEADQUARTERS NET AND ENTERS THE HIGHER HEADQUARTERS NET AS REQUIRED.

** AUXILIARY RECEIVER MONITORS NETS OF HIGHER HEADQUARTERS.

Figure 8-2. Radio net, engineer construction support company.

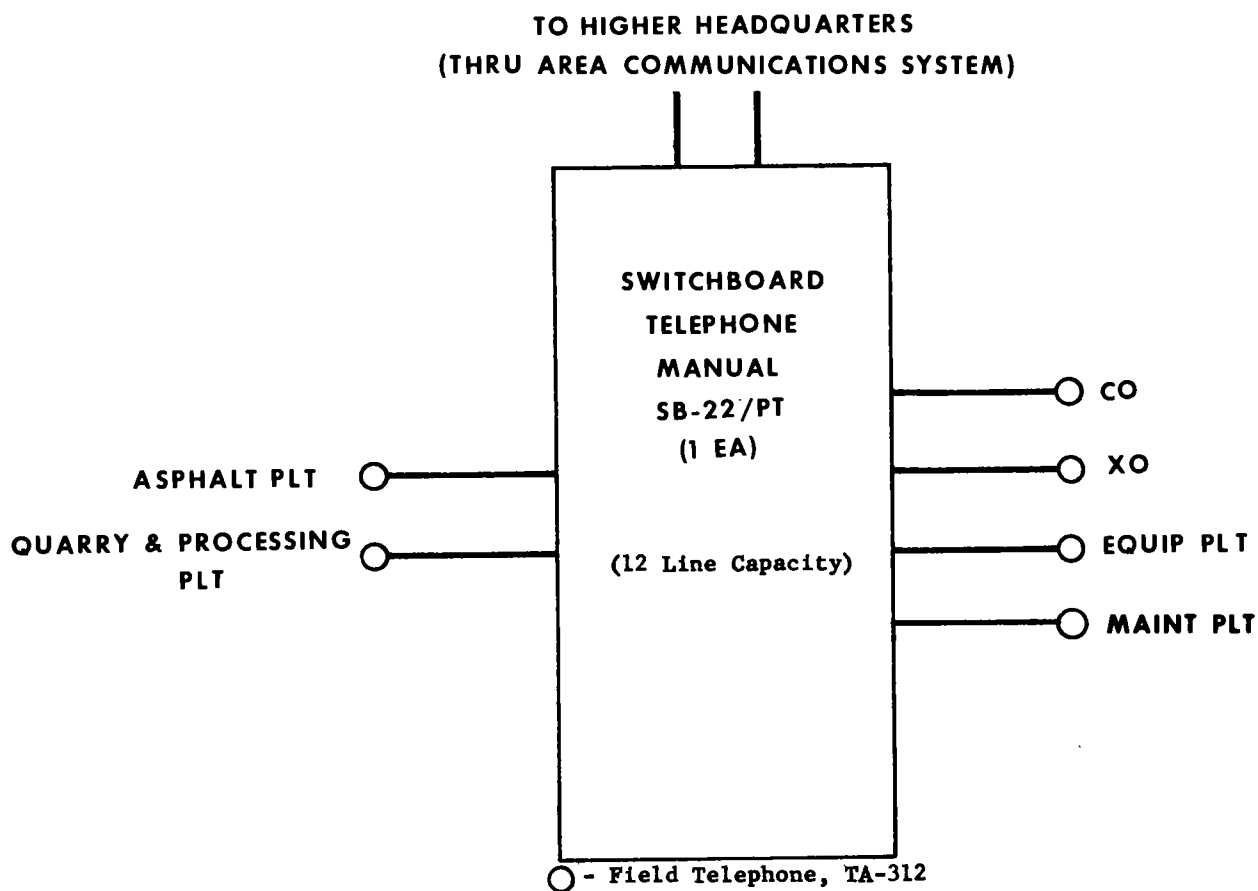


Figure 8-3. Wire net, engineer construction support company.



Figure 8-4. Engineer construction support company operating a rock crusher.



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CHAPTER 9

ENGINEER PIPELINE CONSTRUCTION SUPPORT COMPANY

9-1. Mission

To provide technical personnel and specialized equipment to assist construction and combat engineer units in construction, rehabilitation, and maintenance (excluding organizational maintenance) of pipeline systems, to provide a limited independent capability for construction, rehabilitation, and maintenance of pipeline systems, and to assist using units in specialized repairs.

9-2. Assignment

To an engineer command or an engineer construction brigade. Normally attached to an engineer construction group. May be attached to an engineer combat group.

9-3. Capabilities

a. Level 1. At level 1 this unit can—

(1) Provide advisory personnel to three engineer companies engaged in pipeline construction for pipe-stringing, pipe-coupling, storage tank erection, pump station and dispensing facility construction, and provide specialized tools and equipment for the above functions on a 2-shift basis.

(2) Transporting in one lift over unimproved roads:

21,000 linear feet of 6-inch pipe, or
16,200 linear feet of 8-inch pipe, or
9,000 linear feet of 12-inch pipe.

(3) Construct and rehabilitate pipeline systems and erect storage tanks, when construction units are not available.

(4) Perform organizational maintenance on all organic equipment.

b. Levels 2 and 3. See paragraph 2-4a.

c. Type B Unit. The capabilities of a type B organization are the same as those of a level 1 organization.

(1) The type B column adapts this unit to the lesser requirements for US military personnel.

Existing vacancies indicate the types of positions that can be filled by non-US personnel. The number of such personnel must be determined by the major commander to whom the unit is assigned and will depend on the capacity of available personnel to produce the number of shifts, and other local conditions.

(2) Interpreters and translators required under the type B organization will be provided from appropriate teams available to the theater commander.

d. Individuals of this organization can engage in effective, coordinated defense of the unit's area or installation.

9-4. Organization

The engineer pipeline construction support company consists of a company headquarters, a maintenance and support section, and three pipeline construction support platoons. It is organized under TOE 5-177 (fig. 9-1).

9-5. Duties and Functions

The duties of the company personnel may be found in AR 611-101 and AR 611-201. The functions of the company headquarters and other company elements are discussed briefly below.

a. Company Headquarters. Company headquarters provides the necessary command, administration, mess, supply, and communication elements.

b. Maintenance and Support Section. This section performs organizational maintenance of organic equipment and provides equipment and personnel to support the construction efforts of the pipeline construction support platoons.

c. Pipeline Construction Support Platoons. These platoons provide the necessary skills and specialized equipment to support the efforts of construction units engaged in the construction of petroleum pipeline systems and facilities.

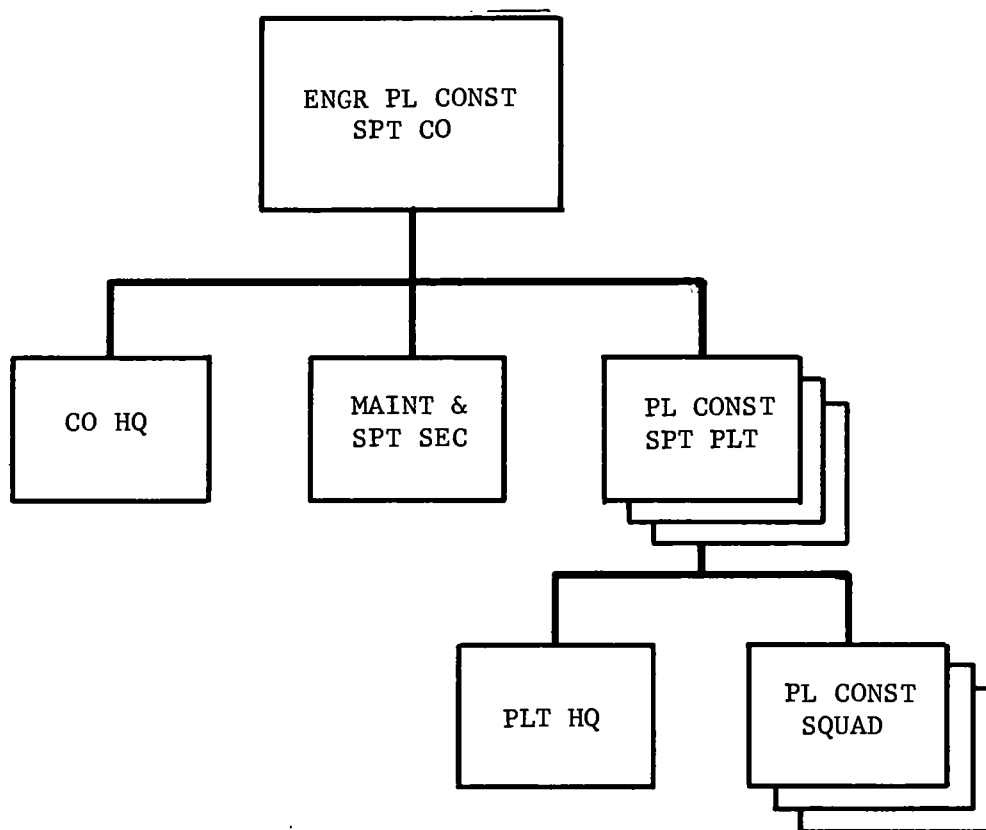


Figure 9-1. Organizational chart, engineer pipeline construction support company.

9-6. Basis of Allocation

Normally one per engineer construction group, TOE 5-112, as required.

9-7. Category

This unit is designed a category III unit (AR 310-25).

9-8. Mobility

Ninety percent mobile using organic equipment.

9-9. Employment

The engineer pipeline construction support company supports the engineer construction battalion in all phases of petroleum pipeline and storage construction through its assigned technical personnel and specialized equipment. Whenever circumstances make it necessary, the engineer pipeline construction support company is equipped to construct or repair pipelines at a reduced rate

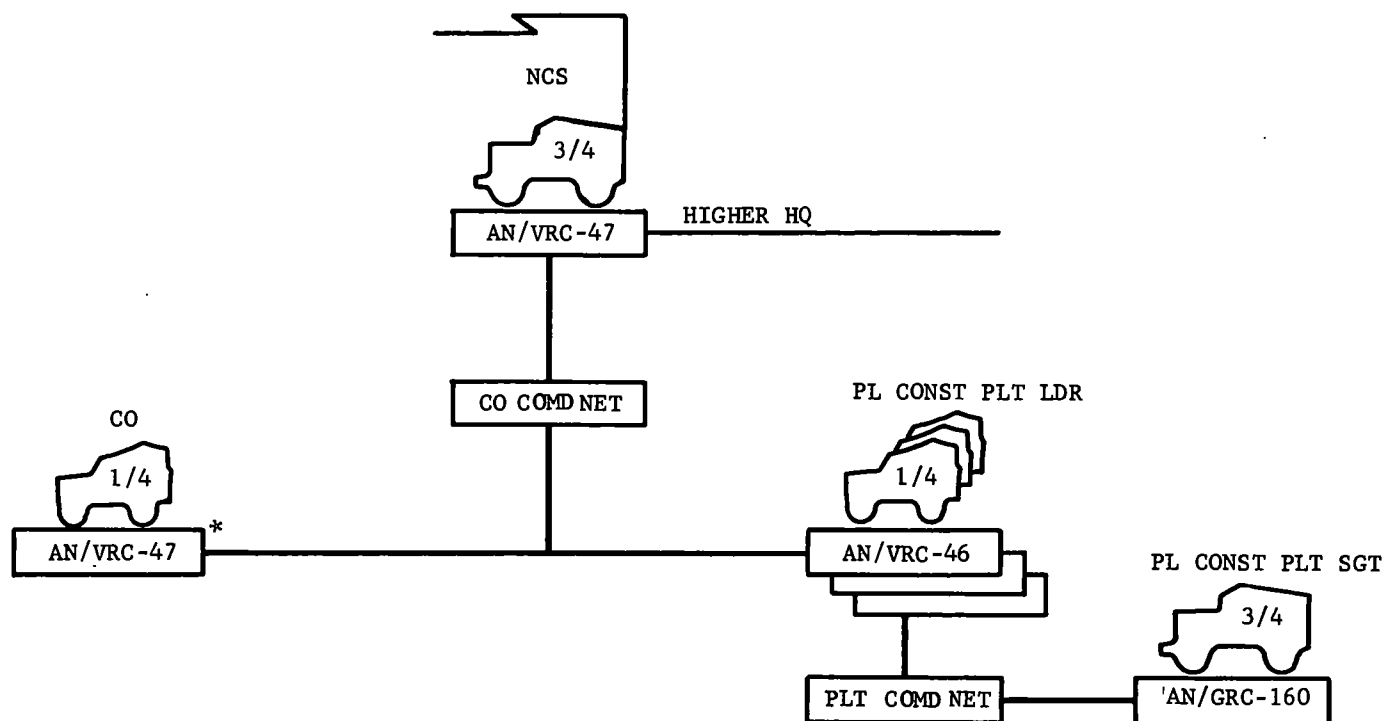
using only assigned company personnel. The pipeline construction support company may support combat engineer units in the combat zone on a mission type basis, when required.

9-10. Major Items of Equipment

The major items of equipment of an engineer pipeline construction support company include generators, a crane-shovel, a scoop loader, a pneumatic tool and compressor outfit, an organizational repair shop, a contact maintenance shop, a full-tracked medium tractor, erection outfits, and pipeline construction equipment sets.

9-11. Communications

The engineer pipeline construction support company provides radio communications between higher headquarters and the company headquarters and between the company and its elements. It provides telephone communications between the company headquarters and its elements. Figure 9-2 shows the radio net and figure 9-3 shows the wire net.



* AUXILIARY RECEIVER MONITORS BDE CMD NET

Figure 9-2. Radio net, engineer pipeline construction support company.

TO HIGHER HEADQUARTERS

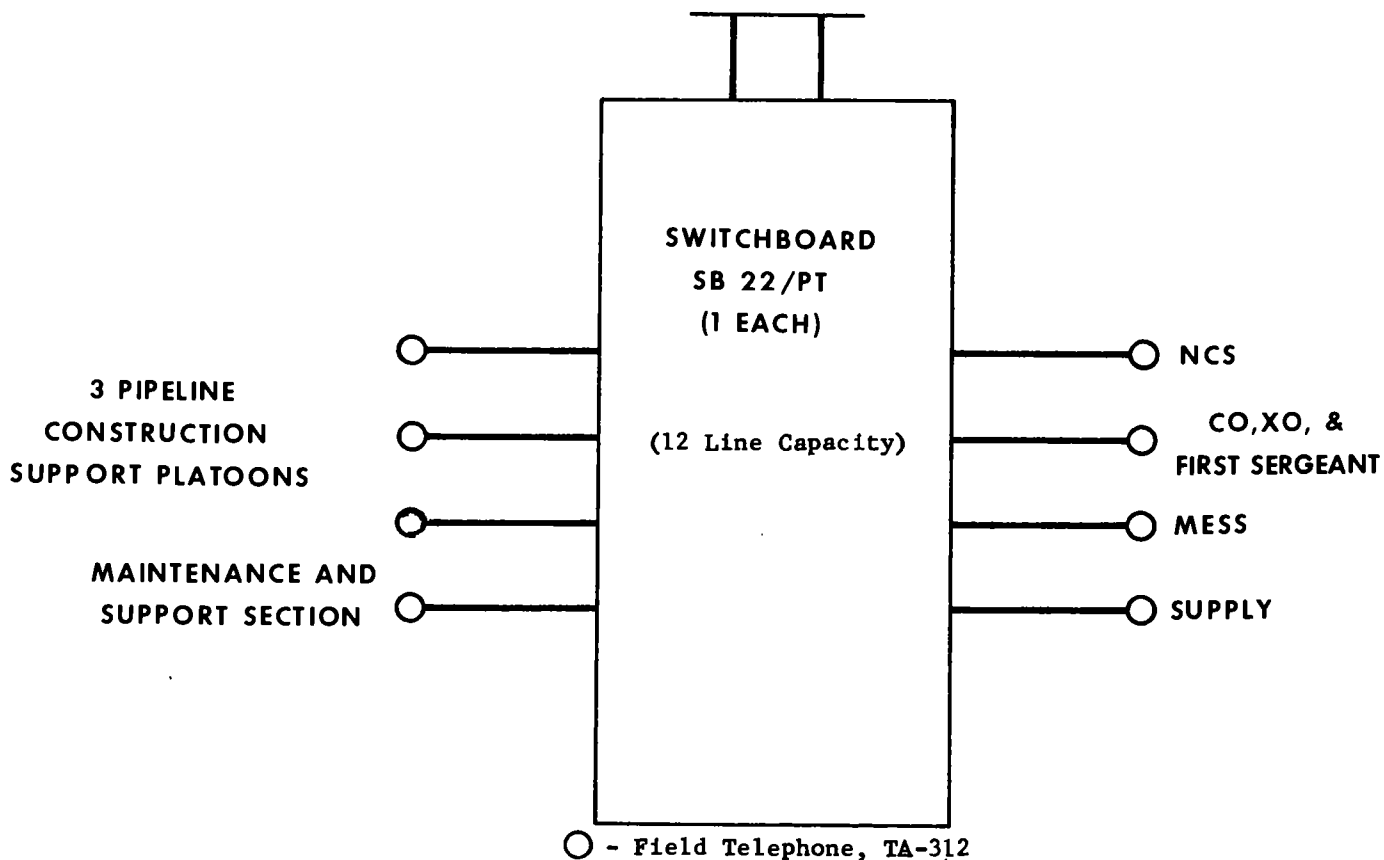


Figure 9-3. Wire net, engineer pipeline construction support company.

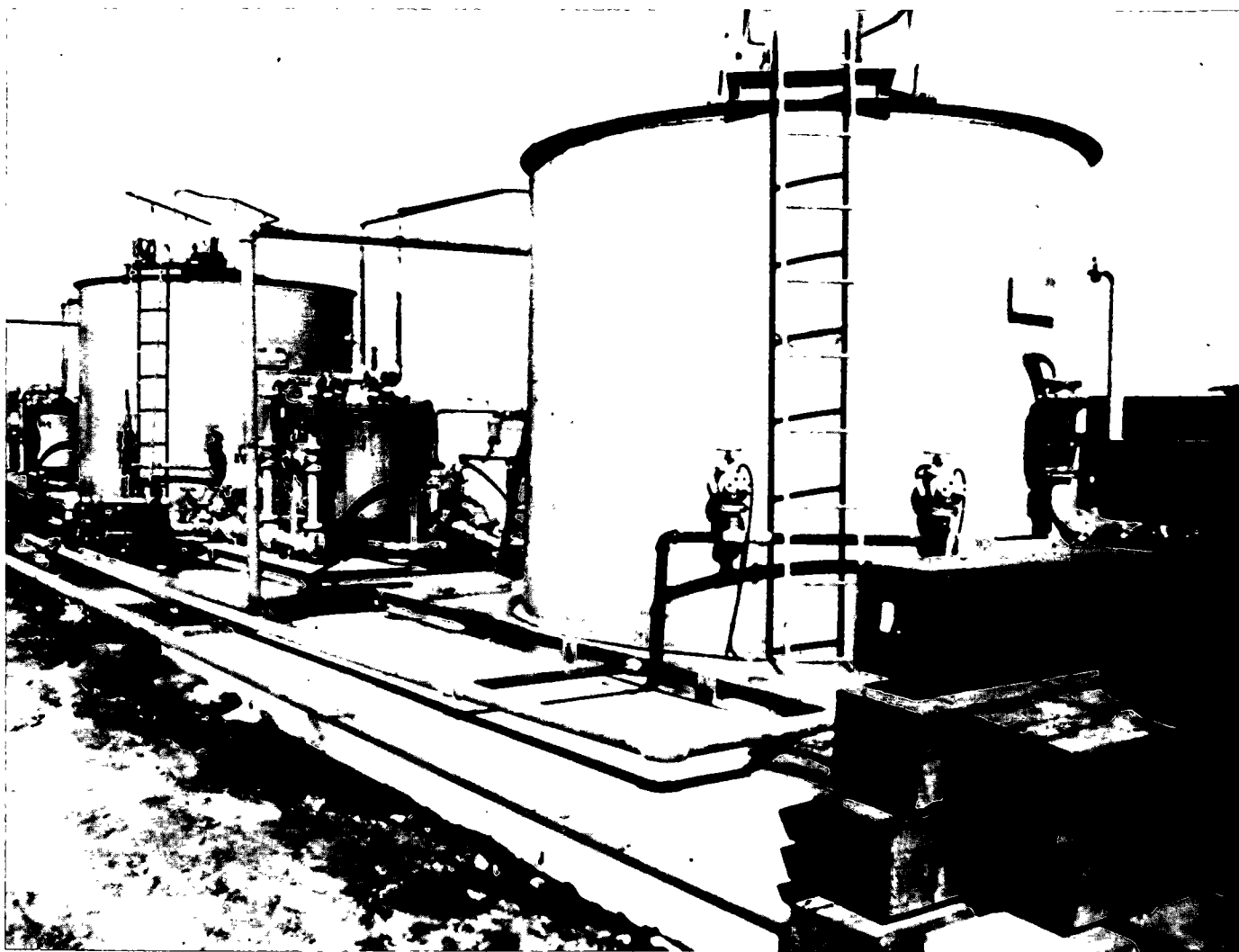


Figure 9-4. POL facility of the type which may be constructed by an engineer pipeline construction support company.

CHAPTER 10

ENGINEER DUMP TRUCK COMPANY

10-1. Mission

Operation of dump trucks for movement of bulk materials in support of other engineer units.

10-2. Assignment

a. To army or corps; for further assignment to an engineer combat group.

b. Assigned to the Engineer Command; for further assignment to an Engineer Construction Group.

10-3. Capabilities

a. Level 1. At level 1 this unit can move 240 cubic yards (struck load) to 312 cubic yards (heaped load) of bulk materials (gravel, earth fill, crushed stone, etc.), per trip; or 240 short tons (cross-country) to 480 short tons (improved roads) of supplies and materials per trip. The amount of materials that the unit can haul in one day will depend on the weather conditions, distance of haul, type of haul route, type of material being hauled, and loading-unloading facilities.

b. Levels 2 and 3. See paragraph 2-4a.

c. Type B Unit. The capabilities of a type B organization are the same as those of a level 1 organization.

(1) The type B column adapts this unit to the lesser requirements of US military personnel. Existing vacancies indicate the types of positions which can be filled by non-US personnel. The number of such personnel must be determined by the major commander to whom the unit is assigned and will depend on the capacity of available personnel to produce, the number of shifts worked, and other local conditions.

(2) Interpreters and translators required when organized under the type B organization will be provided from appropriate teams available to the theater commander.

d. Individuals of this organization can engage in effective, coordinated defense of the unit's area or installation.

10-4. Organization

The engineer dump truck company consists of a company headquarters, a maintenance and service section, and two identical dump truck platoons. It is organized under TOE 5-124 (fig. 10-1).

10-5. Duties and Functions

The duties of the company personnel may be found in AR 611-101, AR 611-112, and AR 611-201. The functions of the company headquarters and other company elements are discussed briefly below.

a. Company Headquarters. Company headquarters provides the command, administration, mess, supply, and communications elements.

b. Maintenance and Service Section. The maintenance and service section provides organizational maintenance for the organic vehicles and has the responsibility for refueling the dump trucks of the platoons.

c. Two Dump Truck Platoons. Each platoon is composed of a headquarters and three identical dump truck sections. These platoons are the operational elements of the company.

10-6. Basis of Allocation

One per engineer combat group or engineer construction group.

10-7. Category

This unit is designated a category II unit (AR 310-25).

10-8. Mobility

One hundred percent mobile.

10-9. Employment

a. The engineer dump truck company usually is attached to, or placed in support of, an engineer unit engaged in the construction or repair of

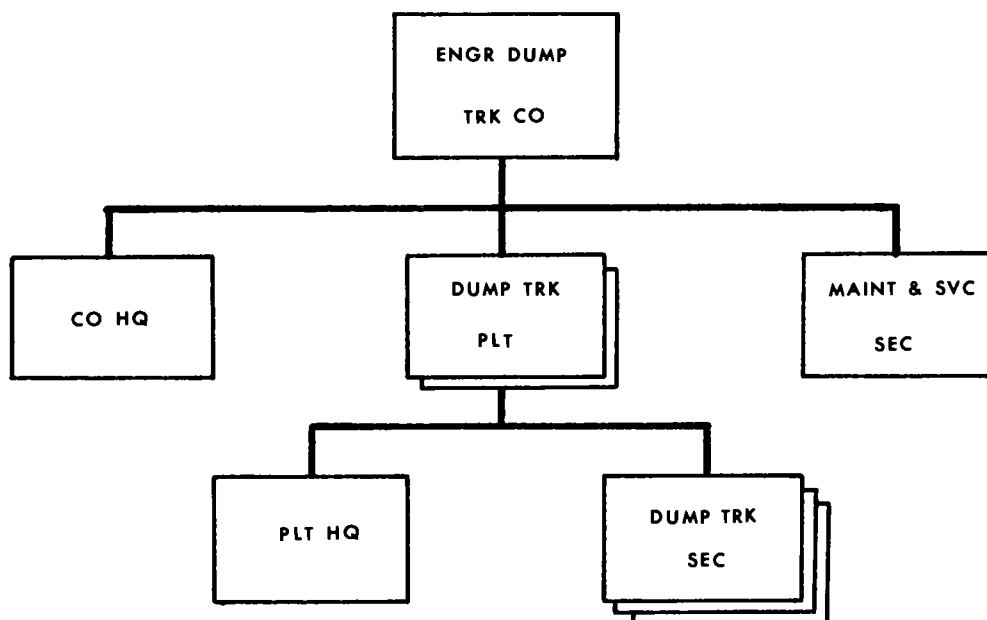


Figure 10-1. Organizational chart, engineer dump truck company.

roads, railroads, aircraft landing facilities, field fortifications, or other tasks requiring the movement of large quantities of bulk materials. The supported unit normally is responsible for loading the trucks. The support may be given by the entire dump truck company, by its platoons, or by sections of the platoons. When subunits are attached to another unit, company headquarters remains with the larger detachment at a central location to permit servicing of the equipment. If great distances are involved and subunits are separated from the company, a portion of the maintenance and service section may also be sent with the subunit to reinforce the maintenance capabilities of the supported unit. When vehicles and personnel are attached to another unit, that unit is responsible for the proper operation and maintenance of the vehicles. The company operates more effectively on mission-type assignments under the control of its own commander than by attachment of its subunits to the supported unit.

b. Employment of dump trucks should be based upon approximately 75 percent of the organic ve-

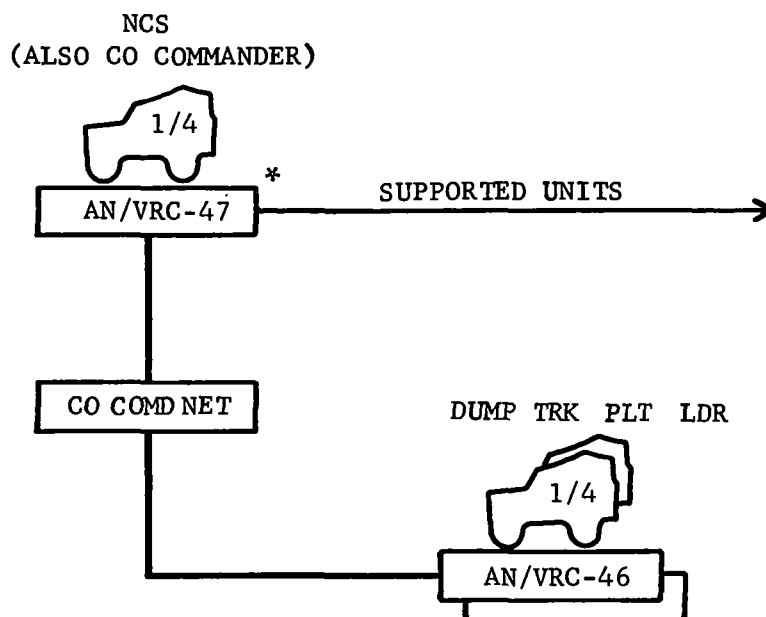
hicles being available at a given time. This permits the company to schedule the required periodic maintenance inspections and minor repairs.

10-10. Major Items of Equipment

The major items of equipment of the engineer dump truck company—in addition to its dump trucks—include a fuel servicing tank truck, a medium wrecker, a trailer-mounted arc welder, and organizational maintenance sets for vehicle maintenance.

10-11. Communications

The dump truck company provides telephone communications between the company headquarters and the maintenance and service section, and between the company headquarters and each of the dump truck platoons. It provides radio communications between the higher headquarters, company headquarters, and the dump truck platoons. Figure 10-2 shows the radio net and figure 10-3 shows the wire net.



*NET CONTROL STATION OPERATES IN THE COMPANY NET, MONITORS THE HIGHER HEADQUARTERS NET AND ENTERS THE HIGHER HQ NET WHEN REQUIRED.

Figure 10-2. Radio net, engineer dump truck company.

(TO HIGHER HEADQUARTERS)
(THRU AREA COMMUNICATIONS SYSTEM)

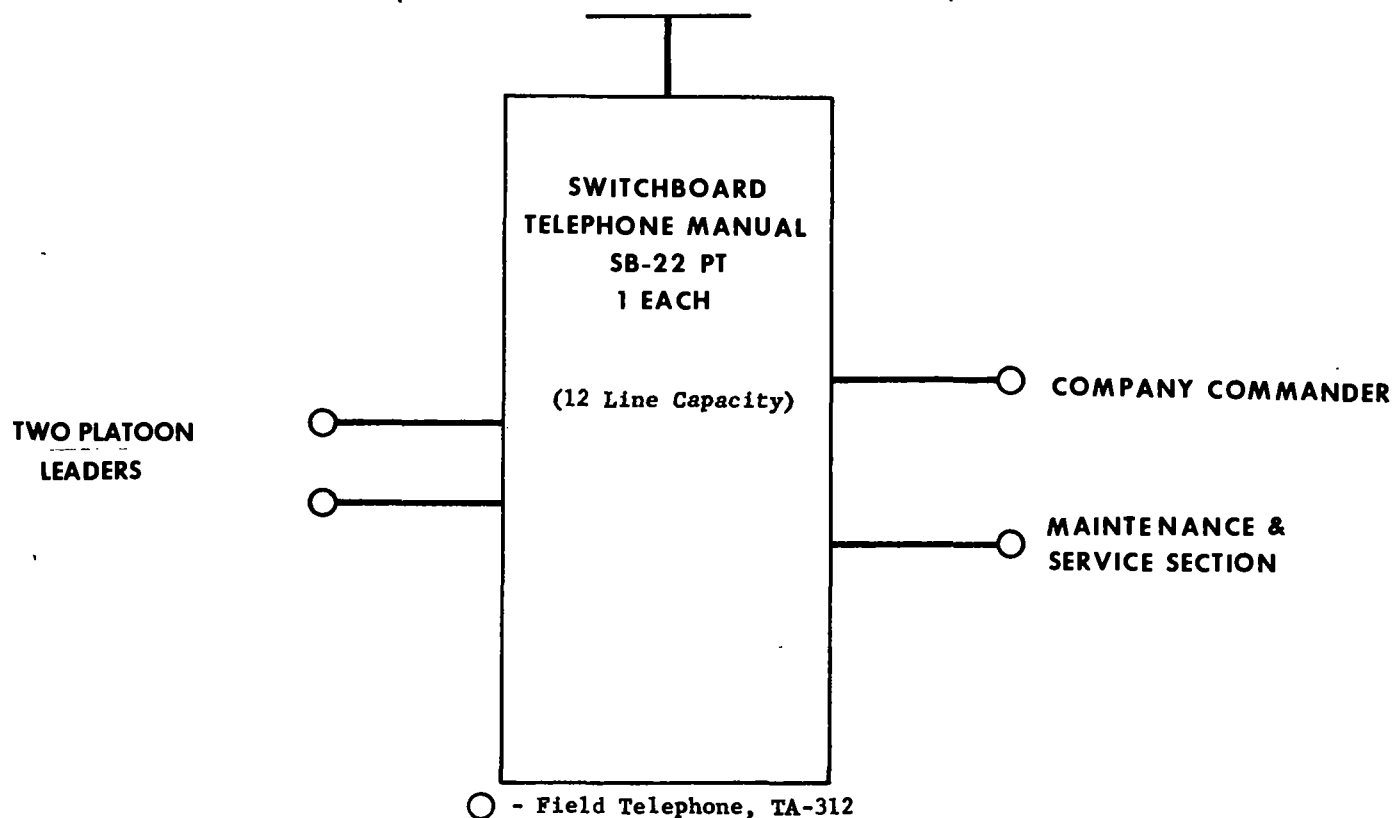


Figure 10-3. Wire net, engineer dump truck company.



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CHAPTER 11

CONSTRUCTION PLANNING AND MANAGEMENT

11-1. General

a. Broad plans and policies for construction in the theater are established by the theater commander in consonance with guidance from the Joint Chiefs of Staff (JCS) and Department of Defense (DOD). They are based on coordinated planning by construction representatives of theater army, the Navy, and the Air Force. The theater army commander establishes policies, standards, priorities, and scale of construction for his subordinate echelons, based upon recommendations of the theater army engineer. In turn, the theater army engineer furnishes staff supervision in the execution of theater army construction directives pertaining to all aspects of construction. The ENCOM commander is responsible for army construction throughout the communications zone. He exercises this responsibility through subordinate brigades, groups, real property maintenance activity (RPMA) units and other assigned units. The Field Army engineer exercises staff and technical supervision of construction in the combat zone through the army and corps engineer brigades. When required, construction units from the communications zone are sent forward into the combat zone to complete mission type tasks. In this event, their activities are coordinated by the field army engineer in conjunction with the responsible engineer in the combat zone.

b. The orderly and rapid execution of an engineer construction mission depends upon thorough and careful planning. While a task is rarely completed without unforeseen difficulties and interruptions, careful planning allows for and reduces such problems, and insures the completion of the work in the allotted time with the allotted men, equipment, and materials. On the basis of accurate information, the engineer commander at each echelon should carefully estimate the requirements of the task and adapt his resources to those requirements. This involves visualizing the execution of the task from its conception to its completion.

c. Operational planning is accomplished at the engineer command, brigade, and group level, with progressively more detailed planning occurring at the lower echelons by the individuals in direct charge of the project. When a battalion is employed as a unit on a single task, battalion planning is limited to the details necessary to insure that work assignments and equipment and material allocations are adequate, and that full use is made of the battalion's capabilities. Battalion planning considers the methods best suited for accomplishing the mission. It does not dictate all details to the subordinate commanders to whom the actual work is assigned—they must be left free to make their own plans within the limits of the overall plan. On a priority project, the subordinate commander is often asked to present his plan for approval, with final approval emanating from group, brigade, or ENCOM.

d. Planning is not terminated with the completion of an initial plan for a particular mission or phase of operation. Rather it is a continuous process; for as operations progress, plans must be reviewed and revised as new developments arise or are anticipated. For a further discussion on planning, see TM 5-333.

11-2. Responsibility

a. Within the theater army headquarters, planning and staff supervision of engineer construction and RPMA functions are the responsibility of the theater army engineer. Major staff coordination is effected with the G4, and liaison with the Air Force, on requirements, acquisition, priorities, and materiel. Plans for construction are based upon requirements generated at subordinate echelons. Only very broad planning guidance, theater army-wide, is initiated by the theater army engineer. He exercises his staff responsibility through technical channels by the exchange of information and through command channels in the form of both orders and directives. On the basis of current plans, the availability of both military and civilian construction supplies, the

availability of civilian labor and construction capability, and the approved priorities for construction, the theater army commander allocates construction troops and materials to subordinate echelons.

b. On a project of battalion-size or smaller, the battalion operations officer prepares plans for the accomplishment of the project to include the allocation of engineer troops and construction equipment to the various tasks in the project. Group headquarters establishes the requirements and may furnish typical drawings to illustrate the type of construction desired, and allocates engineer resources (units) in sufficient quantities to insure timely project completion. The battalion is responsible for site adaptation of plans, field modifications, construction detailing, supervision, and management. Projects larger than battalion-size usually come under the jurisdiction of an engineer construction group, with the group headquarters' operations section doing the planning and assignment of the tasks and coordinating the attached units.

11-3. Construction Directives

The construction process starts with the receipt by a unit of a construction directive—an order to construct, rehabilitate, or maintain some facility. The directive assigns a certain task to the unit, and allows the unit commander to draw materials and any additional equipment he might need to accomplish the task. Group headquarters, acting on general directives from the engineer command, brigade, or higher headquarters, issues job directives or project orders to the unit responsible for the construction. If support from a construction support company is required, that company will receive a directive or order specifying the particular support it will be required to provide. This directive contains the construction plans, designs, specifications, and standards with reference to army or theater standards, when appropriate. This data is prepared at engineer command, brigade, or group headquarters. The construction battalions have a limited design capability, and unless augmented, do not have a capability for extensive design and planning. The directive may specify the jobsite as a result of reconnaissance and planning by the headquarters issuing the directive, or it may require the construction unit to select several tentative sites, conduct reconnaissance, and submit the report on recommended sites for approval. Figures 11-1 and 11-2 show sample construction directives.

11-4. Reconnaissance

a. Construction reconnaissance requires a detailed analysis of the jobsite and a thorough evaluation of all factors relating to the assigned task. Road nets are sketched and overlays are prepared for use with existing maps. Special terrain features are noted which might influence the layout of the jobsite. Reconnaissance missions are assigned to individuals who are experienced in the type of construction involved and who know just what information peculiar to the particular project is necessary. They must be able to recognize the relative importance of all the various factors. If possible and applicable, it is desirable for the commander of the unit for which the completed construction is intended to accompany the reconnaissance party.

b. A study of local methods and materials developed through the years to meet local conditions often yields valuable information. An inspection of local road construction might disclose data on drainage or subgrade which would be helpful in locating and designing new roads, airfields, railroads, and buildings. Existing road surfacing and buildings may indicate that a local material, while not prescribed by Army manuals, is adaptable to the construction being planned. It is wise to use local construction methods when using native materials, as these methods have been developed to meet the limitations and strength factors of native materials.

c. A checklist may be prepared to assure all requirements are met and might include the following:

- (1) Is the area large enough for the facility planned?
- (2) What existing transportation facilities are there?
- (3) What type of terrain exists?
- (4) What are the soil conditions?
- (5) What natural concealment and cover exists?
- (6) What are the existing facilities, and will they provide adequate substitutions for planned facilities?
- (7) Will expansion be possible?
- (8) What sewage disposal is necessary?
- (9) What electrical power exists?
- (10) What will water supply entail?
- (11) What is the proximity of other military installations?

HEADQUARTERS
ENGINEER GROUP

SUBJECT: Construction Directive No. _____

TO: Commanding Officer

Engineer Battalion
APO _____, US Forces

1. MISSION: The exact assignment with all necessary and available information.
2. LOCATION: Either a definite location or general area.
3. TIME: Starting and completion dates.
4. MANPOWER: Either additional troops or indigenous labor.
5. EQUIPMENT: Additional equipment with any special conditions.
6. MATERIALS: Source of, authority to requisition, and delivery time.
7. PRIORITIES: For entire job or parts of the job.
8. REPORTS: As required by higher headquarters.
9. SPECIAL INSTRUCTIONS: Use if appropriate.

FOR THE COMMANDER:

Signed

Figure 11-1. Sample format for a construction directive.

(12) Are skilled or unskilled indigenous labor resources available?

(13) Are natural or local building materials available?

d. The operations and intelligence section of the construction battalion studies the plan and surveys the proposed site. From the reconnaissance reports, it determines the road and rail nets within and adjacent to the site, grades of roads or areas, and the location of all structures and facilities. It determines storm water and surface

water drainage requirements, including ditching and culverts, and what utilities will be required. It prepares detailed site plans, indicating the roads, railroad sidings, building grades, contours, drainage, utilities and all other information pertinent to the project. The referenced army or theater standard plans in the job directive are modified when local conditions dictate, and approval is granted by higher headquarters.

e. If a structure is to be rehabilitated, it is checked for structural stability. Measurements

are taken and records and drawings are made of existing conditions. New drawings are then made showing the special details for rehabilitation. For

further discussion on engineer reconnaissance, see FM 5-36 and TM 5-330.

HEADQUARTERS
____ Engineer Group (Construction)
APO US Forces

10 September ____

SUBJECT: Construction Directive No. 45

CO, ____ Engineer Battalion (Construction)

1. Scope: You are directed to construct a 3,000-man cantonment, standard 4 construction, in accordance with attached drawings and TM 5-302.
2. Priority: A.
3. Location: Vicinity Big Buildup CQ 830295.
4. Real Estate: Release of real estate has been obtained by this headquarters effective 15 September ____.
5. Attachments: By separate directive, the 513th Engineer Company(DT) has been directed to provide one dump truck platoon, with operators and maintenance personnel, to support two-shift-per-day operations. Attachment is effective 150800 September ____ and terminates 100800 October ____ unless sooner released.
6. Schedule: Work may commence not earlier than 150800 September ____ and must be completed not later than 20 November ____.
7. Construction Supplies: Class IV supplies will be requisitioned from HAVITT Depot CQ 844443 in accordance with established procedures.
8. Coordination: Direct coordination is authorized with CO, 8th Inf Bde to establish local priorities within the overall project.
9. Administration:
 - a. Progress Reports: Submitted weekly per SOP this HQ.
 - b. Construction Schedule: Submitted NLT 20 September ____.

FOR THE COMMANDER:

L.A. JACKSON
MAJ S3

Figure 11-2. Sample of a complete construction directive.

11-5. Analyzing and Estimating Job Requirements

The job itself must be carefully analyzed and the requirements of men, materials, and equipment must be closely estimated. This analysis and estimation involves the preparation of:

a. Quantity surveys of work items and materials, upon designs and field surveys. This is a preliminary step conducted by the job planner, to assess known assets. Compilation of facts should conform to requirements set forth in local SOPs.

b. The work estimate sheet listing all work items, aids, and field tests requiring equipment and labor; the dates of completion, quantities and output of each piece of equipment and the manpower required to accomplish the task. Figure 11-3 shows a type of form which may be locally reproduced for this purpose.

c. Equipment requirement schedules which list each piece of equipment, the task it is to perform, and the time period it will be in use (fig. 11-4). For further discussion on equipment scheduling, see TM 5-333.

d. Labor requirement schedule for scheduling work items and the number of man-days required for each task. For larger jobs, this may be expanded to show the required men per task, per day, week, or month (fig. 11-5).

e. Materials requirement schedules which list all materials by type, total quantity of each type, and the amount of each type required each day (fig. 11-6).

Note. Refer to appendix D for other examples of types of analyzing and estimating forms.

11-6. Jobsite Layout

a. Jobsite layout for the construction operation is essential and should be so planned as to result in a smooth flow of equipment and materials. For any project, the layout should be a result of the combined efforts of the battalion commander, the operations officer, their staffs, and the unit responsible for the construction. Reconnaissance reports are studied, and air and ground reconnaissance is conducted by members of the planning section.

b. A layout must take into consideration the necessity for dispersion and should take advantage of such terrain features as ridges and knolls which provide some protection. There must be a

balance between protective dispersion and operational efficiency.

c. Since no two projects are exactly alike and since conditions vary widely, no standard layout can be adopted. Rather each individual construction project must be carefully analyzed in the light of its own peculiar characteristics, i.e., the terrain, materials to be handled or produced, and the condition and extent of existing access roads. For an example of a layout sketch, see figures 11-7 and 11-8; detailed explanation of site layout procedures.

11-7. Scheduling

a. *General.* By scheduling a project in its entirety before the work is started the commander is insured that all phases of a project have been considered and the coordination, materials, equipment, and manpower necessary to support it are available or can be secured at the proper time.

b. *Construction Operations Schedule.* A construction operations schedule is the detailed time plan which coordinates all construction operations for a given project and is the plan that is followed throughout all phases of construction to its completion. The schedule is flexible enough to allow for unforeseen changes, such as materiel shortages or nonreceipt, change orders, enemy activity, severe weather conditions, or equipment breakdowns. Such a schedule also serves as a control chart for assigning manpower and equipment and assembling materials, and is the basis for work directives issued to subordinate units.

c. Scheduling Systems.

(1) *Critical path method (CPM).* The critical path method (CPM) is a formal and graphic means of determining the relationships between tasks associated with any project. It provides a systematic isolation of those tasks that comprise the critical elements which establish the duration of a project. Through such a tool the commander can analyze a project before, during, and after operations. Its greatest asset is the identification of critical tasks and activities. This warns the commander about areas where he can expect trouble in meeting schedules. The validity of this asset depends on the critical path method of analyzing, planning, and scheduling a project following determination of the tasks that must be accomplished to conclude the project successfully. Engineering skill is required to fragment a project into an activities list, construct a logistic network, and estimate activity durations and crew sizes.

Project or Sub-Project Description _____										
Sheet prepared by _____ Project Starting Date _____ Completion Date _____										
WORK OPERATION			EQUIPMENT ESTIMATE (Based on 1 shift each day)				LABOR ESTIMATE (Excluding supervisors and equipment operators)			
No	Description	Quantity	Machine	Estimated hourly Output	Required Machine hours	Number of Machines assigned	Total days Machines assigned	Required Man-hours	No of men assigned each shift	Total days Men assigned
1	CLEARING AND GRUBBING (HEAVY)	48 ACRES	TRACTOR (D7) W/ DOZER	0.25 ACRES	192	3	7	480	6	4
2	STRIPPING 6 TO 18 IN DEEP	43,520 CU. YD.	TRACTOR (D7) W/ DOZER TRACTOR (D7) W/ SCRAPER GRADER MOTORIZED	50 CU. YD. 85 CU. YD. NEEDED AFTER CLEARING & GRUBBING	322 322 120	2 2 1	17 17 12	NONE		
3	DRAINAGE	(SEE P. 6 DETAILS)	TRACTOR (D7) W/ DOZER POWER SHOVEL 3/4 CU. YD. DUMP TRUCK	(SEE P. 6 FOR DETAILS)	120 36 140	1 1 4	12 4 4	} 1320	6	11
4	EXCAVATION DOZER & SCRAPER	65,600 CU. YD.	TRACTOR (D7) W/ DOZER TRACTOR (D8) W/ 12 CU. YD. SCRAPER	50 CU. YD. 85 CU. YD.	340 572	2 5	18 12			

Figure 11-3. Sample work estimate sheet.

To: Commanding Officer _____
From: _____

Project No. 7
Date 12 June
Chart No. 6

[illegible][illegible]

	Spreading							
	Fine Grading							
Crane Shovel 3/4 Cu. Yd.	Excavation							
	Drainage							
Dump Trk 5T.	Drainage	-	-	-	-	-	None	-
	Excavation				6	6	6	6

[illegible]

COMMENT:

SIGNATURE Barry D. Charles
1ST Lt. C.E.

Figure 11-4. Sample equipment requirement schedule.

Project No. 5Chart No. 5

Date _____

WORK ITEM	NUMBER OF LABORERS REQUIRED														TOTAL MAN DAYS	
	MONTH _____							YEAR _____								
	1	2	3	4	5	6	7	5	26	27	28	29	30	31		
CLEARING AND GRUBBING	-	-	12	12	12	12	-								48	
STRIPPING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DRAINAGE	-	-	12	12	12	12	12	2	-	-	-	-	-	-	132	
EXCAVATION	-	-	-	-	-	-	-	4	2	-	-	-	-	-	20	
SPREADING AND COMPACTING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
FINE GRADING								2	10						60	

TOTAL	-	-	24	24	24	24	12	12							260	

Additional remarks: NONE:

Signature: J. D. Smith
1st Lt, CE

Figure 11-5. Sample labor requirement schedule.

Once these steps are completed, the rest of the CPM can be accomplished by computer, if available. The computer is significantly faster than manual computation for time analysis of any network with more than 50 activities, thus CPM updating and reporting become much easier. Before undertaking the critical path method, the availability of a computer with CPM programs should be investigated. (See TM 5-333, for CPM methodology, and appendixes B and D for a type CPM program and recording forms.)

(2) *Program evaluation and review technique (PERT)*. PERT is similar to CPM, but incorporates mathematical probability in predicting project completion times. It is used primarily in situations where there is some uncertainty about the amount of time required to complete specific activities. In CPM, once the activity duration is estimated, it is assumed that this estimated value will equal the actual time it takes to perform that activity. PERT, on the other hand, requires the estimator to provide three time estimates for activity duration—an optimistic time, a most likely time, and a pessimistic time. These three times, when combined mathematically, provide an

adjusted time for the duration of an activity; when added with other durations and activities they form the PERT network. PERT, while usable for construction project management and scheduling, is primarily most valuable for use in research and development. If used for construction planning it would be most valuable where a construction unit has had little experience with the task they are to undertake, or where important variables such as weather extremes are involved. Further information on PERT is found in pertinent manuals published by the Department of Defense, US Air Force, National Aeronautics and Space Administration, or the US Army Command and General Staff College.

11-8. Supervision

a. *General*. Supervision consists of those actions taken by a commander and his staff to direct and control subordinates. This process is accomplished by the application of three primary steps of supervision:

- (1) Set objective standards.
- (2) Measure performance against standards.

		PROJECT NO. <u>7</u>																	
		CHART NO. <u>6</u>																	
		DATE <u>27 JULY 19</u>																	
MATERIEL	TOTAL QUANTITY	DAILY REQUIREMENTS FOR <u>AUG</u> (MONTH)																	
		1	2	3	4	5	6	7	8	9	10	11	12	13					
		19 (YEAR)																	
		23	24	25	26	27	28	29	30	31									
CONCRETE																			
CEMENT	(1,000 CU. YDS.) 6000 SACKS	500	600	400	400	400	400	400				600	600	150	150	150			
FINE AGGREGATE	500 CU. YDS.	25	25	40	40	40	40	40				50	50	12	12	12			
COURSE AGGREGATE	750 CU. YDS.	40	40	60	60	60	60	60				75	75	18	18	18			
WATER																			
MIX	32 (1,000 GAL)	2	2	2	2	2	2	2				3	3	1	1	1			
CURING	100 (1,000 GAL)		1	2	3	4	4	4				4	4	4	4	4	4	3	2
SURFACE TREATMENT																			
MC-1 (PERMANENT)	70 TONS			10	10	10	10	10	10										
MC-3 (BINDER COAT)	100 TONS											10	10						
MC-3 (SEAL COAT)	70 TONS													10	10	10	10	10	10
AGGREGATE (BINDER COAT)	800 YDS.											8	8						
AGGREGATE (SEAL COAT)	420 CU. YDS.													3	3	3	3	3	3

COMMENTS: None

SIGNATURE H.H. Maclean
Capt. CG

Figure 11-6. Sample materials requirement schedule.

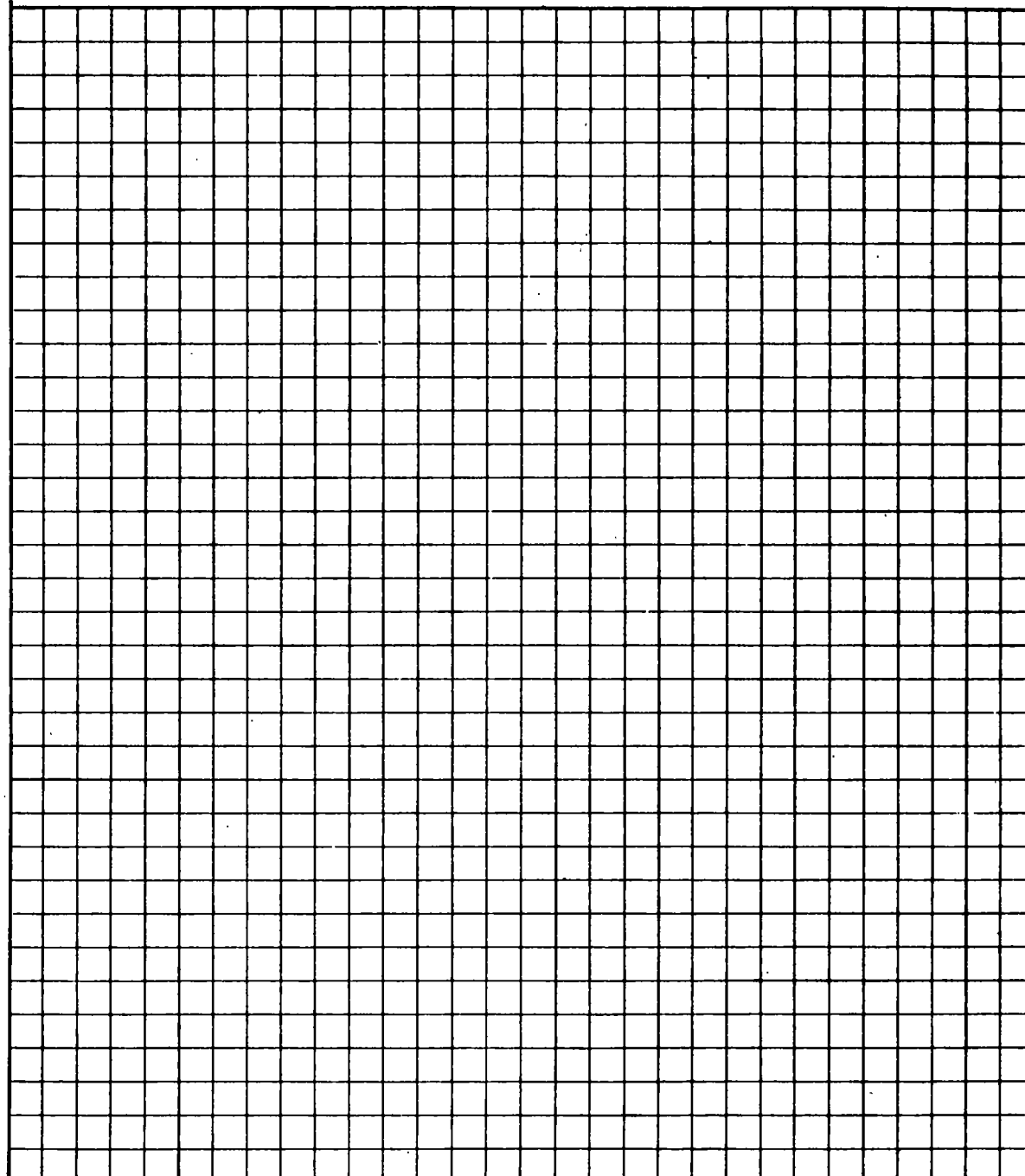
LAYOUT SHEET

PROJECT _____

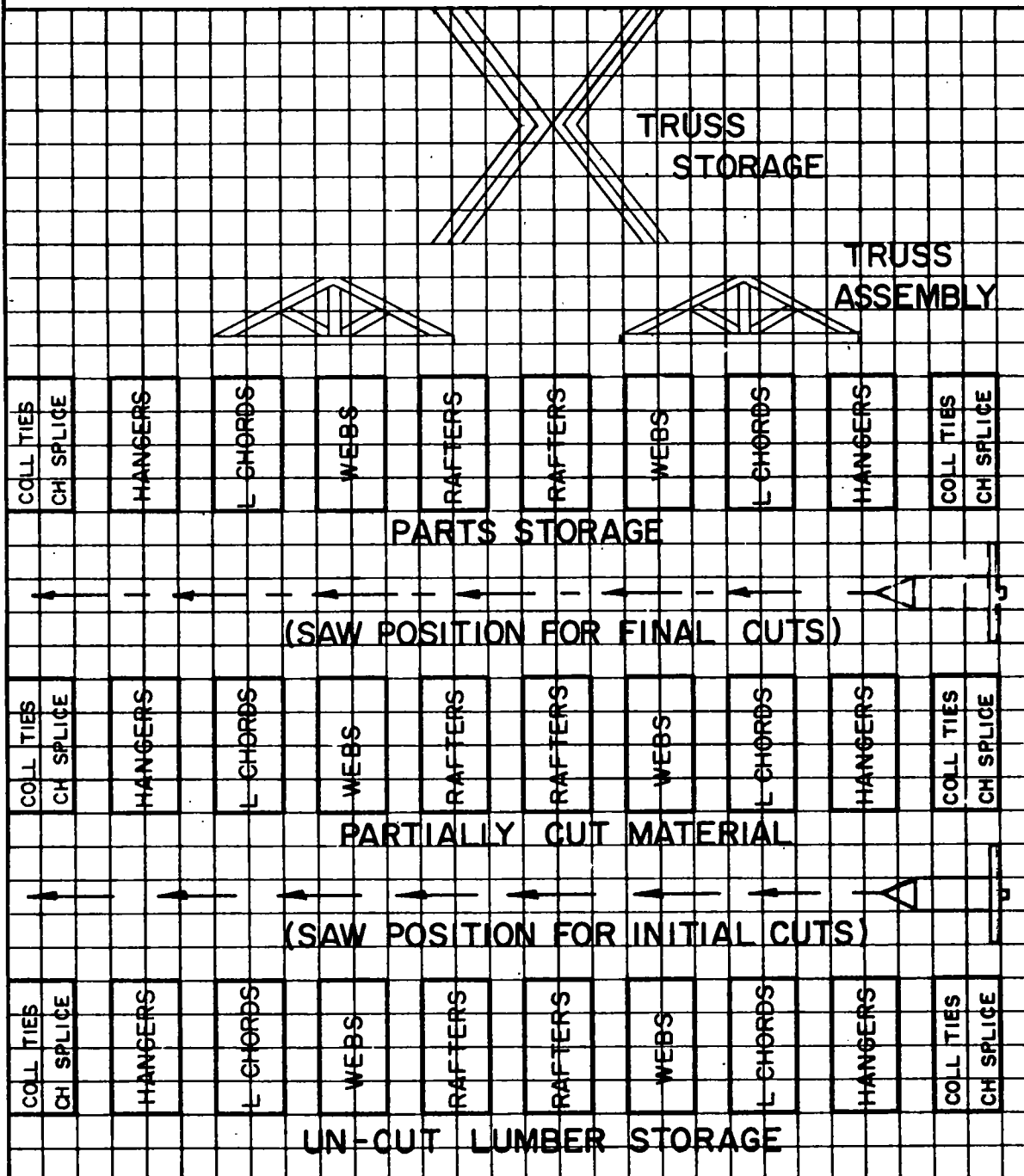
SCALE _____

DATE _____

PAGE _____ OF _____

*Figure 11-7. Sample layout sheet format.*

LAYOUT SHEET

PROJECT LAYOUT SKETCH NO. 1* (4000 TRUSS UNITS)SCALE 3FT X 3FTDATE 1 MAY 1965PAGE 1 OF 1

* USING ONE SAW

Figure 11-3. Complete layout sheet.

(3) Make adjustments where performance does not meet standards.

b. Methods of Supervision.

(1) *Communications.* The most important factor to be considered by the supervisor is effective communications. These may be either written communications, such as regulations, SOPs, directives, policy memoranda, or reports, or verbal communications like inspections, conferences, and briefings.

(2) *Control devices.* Construction operations rely heavily upon two control devices, which are forms of communication, and which provide the supervisor with an invaluable source of performance data. These two control devices are inspections and reports.

(a) *Inspections.* Announced inspections are used to bring the unit up to a specified performance level by the inspection date, and are best suited for control of one-time-only activities, such as the inspection of a building before turnover or the inspection of a new property book. Unannounced inspections (spot checks), on the other hand, are used to measure the unit's normal performance, and are most effective for the control of continued tasks or procedures, such as maintenance or the utilization of manpower on a job. (See sample inspection forms in appendix D.)

(b) *Reports.* Reports are used to supplement inspections to conserve the commander's time and staff resources. A good reporting system provides the commander a continuous flow of valuable information that saves time and serves as a control device for assessing performance. These reports should be supplemented by inspections that can verify the content of reports. (See appendix D for sample reports.)

(3) *Management practices in TOE units (MAP-TOE).* Each unit in the active force structure becomes involved in the management of personnel and resources. This is especially true of engineer units, where the application of the various techniques of management results in rapid accomplishment of technical (and sometimes difficult) engineering tasks. MAP-TOE is an innovation for managers, encompassing several old and proved ideas. In very basic terms it is simply a collective term to describe the several techniques that make up a concept of management applicable at the "first-line-supervisory" level. The concept employs several work measurement forms and techniques and relies upon the seven functions of the manager: establishing objectives, motivating, communicating, innovating, maintaining cooperation, developing subordinates, and decision making. (See DA Pam 5-2 for concept, work management forms, and application techniques.)



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CHAPTER 12

OPERATIONS

Section I. TACTICAL OPERATIONS

(STANAG 2041) AND

(STANAG 2079)

12-1. General

Although the primary mission of engineer construction and construction support units is to construct, rehabilitate, and maintain air, sea, and land routes of communication and related facilities, these units must always be ready to defend themselves. They must maintain close-in security on the march, in bivouac, and on the job and must be prepared to participate in rear area security and area damage control and, within the limits of their equipment and training, be prepared to support offensive and defensive operations. They must also be prepared to support indigenous military and paramilitary forces and US Army units in the conduct of stability operations.

12-2. Offensive Operations

Engineer construction and construction support units may be used to support an offensive operation by moving into the field army service area of a combat zone via area or task assignment to assume responsibilities for the repair and maintenance of routes of communication—responsibilities normally assigned to the nondivisional engineer combat units. This permits the nondivisional engineer units to move forward and provide close nondivisional engineer support to the attacking forces. The primary task of construction and construction support units when so employed is to repair and maintain the routes of communication—to include aircraft facilities—within the field army service area, keeping them open and passable for the supplies and combat troops moving forward.

12-3. Defensive Operations

a. During a defensive operation, engineer construction units conduct reconnaissance; repair,

maintain, and improve routes for supply and evacuation; assist in the organization of the ground; construct command posts, observation posts, emplacements, and obstacles; and assist in flank and rear area security.

b. In the event of a speedy withdrawal or enemy breakthrough, the haste with which the engineer work is performed increases. Emphasis is placed on assistance in the movement of the retiring columns and delay of the enemy by destructing bridges, railways, and roads, and constructing barriers (FM 5-25 and FM 55-21).

c. Denial operations are planned and executed as part of the theater operations plan. They are set forth in a special denial annex to the operations plan (FM 31-10). Engineer construction battalion commanders may be given denial responsibility for their own supplies, materials, and equipment, and must move them to the rear or destroy them in place. A battalion commander may be given an area responsibility involving denial of both military and civilian materials and equipment within that area, requiring movement to the rear or destruction in place. Denial operations involve the destruction or removal, as applicable, of military equipment and installations, military supplies, routes of communication facilities, signal communication facilities, utilities, industrial plants, fuels, food, motor transportation, raw materials, ships and port facilities, building structures, and locks and dams.

12-4. Stability Operations

a. Stability operations are defined as that type of internal defense and internal development operations and assistance provided by the armed forces to maintain, restore, or establish a climate of order within which responsible government

can function effectively and without which progress cannot be achieved.

b. Engineer advisers, teams or units may be required to support stability operations in a host country encompassing all levels of intensity of subversive operation. US Army engineer forces initially committed probably will be special units formed from Team KB (engineer civic action control) and Team KC, (engineer civic action advisory, TOE 5-560). In more advanced stages of stability operations, engineer construction, construction support, and engineer service units may have to be deployed in support of a host country's struggle against insurgency. In addition to their primary mission of construction, rehabilitation, and maintenance of routes of communication, these units may also be required to provide training and advice to host country engineer forces. The facilities engineering districts, groups, and teams—although supporting the military can be used to assist the engineer civic action teams in their mission and vice versa. Engineer support must be closely coordinated with other US agencies to insure efficient programing. Coordination and free exchange of ideas with the local civil authorities is of equal importance. Whenever possible, projects should be established as joint enterprises between indigenous military and civil forces. In many situations, engineer functions will involve pioneer tasks accomplished with local materials and limited equipment. Improvisations and the use of field expedients will be the rule rather than the exception.

c. Military civic action provides the engineer commander with a method to improve his civil military relationships, and strengthen the socioeconomic posture of the area. Through civic action programs, military forces are able to reduce sources of civilian discontent and add materially to political stability and security. Engineer units have the capability of participating in civic action projects; first through planning and technical assistance to local government agencies, and second, through provision of additional resources in the development of their civic action programs. The following list is considered representative of engineer tasks in support of civic action.

- (1) Constructing simple irrigation and drainage systems.
- (2) Reclaiming land by clearing and draining swamps.
- (3) Grading operations.
- (4) Setting up and operating sawmills.

- (5) Devising and constructing flood controls.
- (6) Assessing and developing acceptable sand and gravel sources for road work and general construction.
- (7) Constructing houses and other buildings.
- (8) Constructing repairing, or improving roads, bridges, railway equipment, and airfields.
- (9) Improving sanitary conditions.
- (10) Providing safe water supply systems.
- (11) Preparing maps and charts as required for planning road, railroad, and airfield projects; irrigation and land development; political subdivisions and geographical features; and land use.
- (12) Constructing, repairing, and operating utility systems.

d. For more details, see FM 31-23 and FM 100-20.

12-5. Security (STANAG 2041)

a. Security encompasses all measures—active and passive—taken by a command to protect itself from surprise attack, observation, and annoyance by the enemy. All engineer commanders are responsible for the security of their own commands—to the degree determined by the enemy situation, the terrain, positions of friendly troops, mission of the command, and—most important—the security measures taken by a higher command. The provision of absolute security for an engineer construction unit is impracticable. Absolute security would require all members to engage actively in a security mission, which would make it impossible for the unit to accomplish any other mission. Rather, the engineer commander adopts sound and reasonable measures and determines the size of the security detachment accordingly.

b. Construction operations are extremely vulnerable to guerrilla activities. The destruction of communications means is common; and materials, installations, and sources of raw materials are often targets of guerrilla sabotage. Units must have security at work sites as well as during any temporary halt. Perimeter protection provides a measure of security and can be achieved by a unit using its own troops or by arranging for the provision of security forces from adjacent units. At times arrangements can be made for the using units to provide jobsite security for the constructing unit during a project. In either case, it must

be stressed that engineer efforts become limited or delayed if adequate security is not provided.

c. During movement, an engineer commander has various methods of providing the necessary march security; the choice will be dictated by the situation. There is usually a frontal security force, an advance guard, and security forces to the rear and on the flanks. Single vehicles and convoys that cannot provide their own security are grouped and escorted through danger areas by armed security detachments which have been organized by the area commands and which may consist of elements of armor, infantry, and combat engineers (See FM 31-22 and appendix H for more information on convoys.)

12-6. Rear Area Protection (STANAG 2079)

a. The commanders of armies and theater army support command are responsible for the general protection of their respective areas. They establish rear area control centers with appointed controllers. Depending upon the size and organization of these areas, subarea control centers and subarea controllers may also be established. These centers are responsible for assisting in the planning and for organizing, supervising, and conducting rear area security and area damage control within their respective areas. The concept of rear area security and area damage control is essentially that of taking preventive measures and, failing that of mutual support of the various areas, installations, and units. Planning anticipates disastrous damage to each element in the area and designates the source of recuperative assistance to each element.

b. Rear area security forces consist of military forces located in the rear areas. They include the permanently or semipermanently located combat support and combat service support units; combat units stationed in the rear area for defense of that area; combat units in transit, in reserve, and in rest areas; air defense units; personnel replacements; and Air Force and naval forces. The limited number of combat units available for rear area security is held under a centralized control to provide a mobile reserve and patrol; these units are not used to garrison static defensive positions or to protect installations. Defense positions are manned by the service support units and administrative units which are trained to perform infantry type missions by practice alerts and by tactical exercises.

c. Rear area damage control forces consist of

heavy rescue teams furnished by engineer construction, and construction support units and by ordnance maintenance units. The number of teams depends upon the area damage control plan. The size of these teams varies with the size of the disaster. The basic unit is the organic squad equipped with squad tools, air compressors, bulldozers, and a crane or heavy wrecker. From the squad, the team can be increased to platoon, company, battalion, or even larger size, if the situation is critical enough to warrant such an increase. These teams enter the disaster area and move heavy loads, clear routes of communication of rubble and debris, fight fires, salvage equipment, and rescue personnel. Light rescue teams are organized by company-size units, except medical units and those units furnishing heavy rescue teams. These teams also use the squad as a basis. They rescue personnel and equipment when such rescue does not require the use of heavy equipment. Labor teams of squad size are furnished by all company-size units. These teams perform tasks which do not require special training or equipment. Decontamination teams are also organized as company-size units and perform decontamination activities within a prescribed area if CBR hazards are encountered.

d. The use of either tactical or service troops in a manner that detracts from their ability to perform their primary mission is a command decision. Engineer units with area damage control missions, prescribed under approved area damage control plans, continue to operate under their engineer commander. Upon implementation of the plan, those portions of the engineer units with area damage control missions are directed and supervised by the rear area security controller or subarea controller.

e. See FM 31-85, for details.

12-7. Defense Against Air Attack

Defensive measures by engineer units consist principally of developing a passive and active air defense.

a. Passive air defense is directed toward the protection of personnel and equipment by training personnel in aircraft recognition; digging shelters for personnel near work areas and bivouacs; dispersing vehicles and equipment; concealing bivouacs and work areas, and providing an effective warning system.

b. Active air defense is limited to engaging low

flying hostile aircraft with small arms fire. The low altitude air threat which may face engineer units is partially countered by the aggressive use of large volumes of fire which unit (non-air defense) weapons can place against this threat. Large volumes of fire from non-air defense weapons have proved capable of destroying both high and low speed aircraft or disrupting their attack. Use of unit weapons in this role must be balanced against the requirement to prevent disclosure of position, and premature expenditure of ammunition. Engineer units standing operating procedures should cover, but not be limited to, the following items relevant to engagement of aircraft by non-air defense weapons:

(1) *Applicability.* Operators of designated weapons.

(2) *Relation to primary mission.* Primary mission is never prejudiced.

(3) *Relation to passive air defense.* The necessity for aggressively engaging hostile aircraft is balanced with the requirement to place in

proper perspective the tactic of withholding fire to preclude disclosure of position.

(4) *Authority to engage.* Authority to engage attacking aircraft is delegated to individual weapons operators to engage hostile aircraft on orders through the unit's chain of command, subject to the rules of engagement and rules for withholding fire.

(5) *Rules of engagement.* Normally self-defense only against all attacking aircraft and those positively identified enemy aircraft which pose a threat to the unit.

(6) *Rules for withholding fire.* When ordered. When not positive that aircraft are actually attacking or otherwise hostile. When friendly aircraft or troops are endangered.

(7) *Firing techniques.* Lead and super-elevation. Massed fire. Maximum rate of fire. Maximum use of tracer ammunition.

(8) *Unit training requirements.* Motivation and discipline. Gunnery. Aircraft recognition.

Section II. ENVIRONMENTAL CONSIDERATIONS

12-8. General

Operations in desert areas, northern areas, mountain regions, jungles, and forests make it necessary for an engineer commander to deviate from standard operating techniques. Certain environments require specialized items of equipment or material. Other environments require modification kits to adapt standard items for operations in the locale. For example, operations in the arctic require special arctic clothing and equipment for personnel, special vehicles for operations on ice and snow, and special materials such as high-early cement, special paints, and arctic lubricants. Construction techniques and styles also vary to a great degree because of differences in soil and

climate. Each special environment requires study by commanders and their staffs. This study would include a review of the physical characteristics of the area, the special equipment needed, and the variance of construction techniques from the normal.

12-9. References

For a general discussion of special environmental considerations see FM 5-1 and FM 100-5. For specific and detailed discussions, see FM 31-25 for desert operations; FM 31-35 for jungle operations; FM 31-70 and FM 31-71 for cold weather and northern operations; FM 31-72 for mountain operations; and FM 21-40 for CBR operations.

Section III. LOGISTICS

12-10. Supply

a. Supply for a unit involves determination of requirements, and their requisitioning, receipt, and distribution. All commanders are responsible for insuring that the determination of requirements is economical and reflects only actual needs for efficient unit operations and maintenance; that the supplies are requisitioned and received; that they are properly safeguarded; and that they

are distributed to the proper units, at the proper time, in the proper amounts and condition, and in accordance with established priorities.

b. Equipment and supplies to be carried by individuals and units are authorized by unit TOEs, MTOEs, TDAs, and other authorizing documents, and in directives from the commanders. As these supplies are expended, they are replenished from the supply facilities in the communications zone and the army area.

12-11. Request for Supplies and Equipment

a. Engineer units operating in the COMMZ receive direct support supply and services (less medical and ammunition) from TAACOM or its stock control agency. Direct support medical supply and services are provided by the Medical Command, TASCOM, while direct support ammunition supply and services are provided by the ammunition group, materiel command, TASCOM. Requests to the appropriate subordinate units of these commands are prepared and submitted in accordance with instructions from higher headquarters and the unit SOP and schedules are established by the supply officers. They contain enough information to identify the requesting and supplying elements and to indicate exactly what is needed and the quantities required. The battalion/separate company supply officers prepare the requests based on the informal requests submitted by subordinate units. Separate companies prepare and submit their requests directly to the proper supply point or depot.

b. The supply officers of the engineer command, brigade, and group are not in the supply channel, but they help battalions and separate companies obtain unusual or critical items of supply or equipment.

12-12. Distribution

Supplies are issued to units by either supply point distribution or unit distribution.

a. In supply point distribution, the receiving unit draws its supplies at a supply point, depot railhead, or truckhead. The receiving unit uses its own transportation to move the supplies to its area.

b. In unit distribution, the issuing agency transports the supplies to the user.

c. Distribution of Supplies to Units.

(1) Class I supplies (subsistence).

(a) Engineer units transmit a unit strength report to their supporting supply point. A formal ration request is not required.

(b) The reviewing unit draws its rations at the class I supply point.

(2) Class II supplies (clothing, tool sets, individual equipment, administrative).

(a) Engineer units submit requests for class II supplies to supporting direct support supply and service units using single line item request forms as prescribed by AR 710-2.

(b) Requisitions for regulated and command controlled items are processed through command channels. Requests are submitted through intermediate commands to the approving commander. Following approval, the appropriate stock control agency issues shipping instructions to the storing general support unit which makes shipments directly to the user.

(3) Class III supplies (POL).

(a) Engineer units transmit forecasts of requirements and informal requests for delivery to supporting direct support supply and service units.

(b) Delivery may be made to the engineer unit by tanker trucks of the DS supply and service unit. In other cases where appropriate, the supply and service unit may operate a dispensing facility for supported units.

(4) Class IV supplies (construction).

(a) Engineer units submit requests for construction supplies to the supporting DS supply and service unit.

(b) Requisitions are forwarded electronically to the commodity managers at the inventory control center (ICC). Upon approval, a material release is issued authorizing shipment to using units.

(5) Class V supplies (ammunition).

(a) Engineer unit submit estimates of ammunition and explosives (required supply rate) through command channels. Approved expenditure (available supply rate) is announced by commanders and constitutes authority to request delivery.

(b) Engineer units prepare transportation orders for class V requirements within the available supply rate and transmit the request to the supporting direct support ammunition supply unit.

(c) Supply point distribution is normal.

(6) Class VI supplies (personal demand items).

(a) Sales facilities are operated by direct support supply and service units.

(b) Engineer units obtain personal demand items from mobile exchanges operated by direct support supply and service units or by using facilities in the supply and service unit area.

(7) Class VII (major end items) and Class X supplies (nonmilitary items).

(a) Engineer units submit requests to supporting DS supply and service units.

(b) Direct support units forward requisitions electronically to commodity managers and procedures similar to those used for Class II regulated items are used.

(8) Class VIII supplies (medical).

(a) Engineer units submit requests for medical supplies to medical depots in accordance with AR 725-50 and AR 710-2.

(b) Alternative methods are normal to allow flexible, responsive support to user demands. Designated medical facilities in the combat and communications zone will respond to requests for medical supplies for use in engineer units.

(9) Class IX supplies (repair parts and components).

(a) *Repair parts for items other than low-density items.* Engineer units submit requests to supporting direct support maintenance units in accordance with AR 710-2.

(b) *Repair parts for low-density items.* Certain designated engineer units have direct support maintenance responsibility for low-density items. Authorized stockage lists in accordance with AR 710-2 are prepared and requisitions for repair parts are forwarded through the supply distribution system. Repair parts are issued by general support repair parts supply units.

(c) Engineer units with organic direct support maintenance capability for organic engineer equipment and power generators include:

1. Engineer construction battalion (TOE 5-115).
2. Engineer construction support company (TOE 5-114).
3. Engineer port construction company (TOE 5-129).
4. Engineer topographic battalion (TOE 5-346).
5. Engineer base reproduction company (TOE 5-347).
6. Engineer base survey company (TOE 5-348).
7. Engineer base photomapping company (TOE 5-349).

12-13. Local Procurement

a. *General.* Every effort is made to simplify the problems of supply by local procurement. Class IV supplies include many items that can be procured locally, such as lumber, cement, structural steel,

railroad rails and ties; manufactured items such as plumbing and electrical supplies, hardware, paints, camouflage materials, and repair parts.

b. *Utilizing Local Resources.* Engineer commanders and staff officers at all levels must always be alert to locate and use local resources. Policies governing use of local resources are set forth by the theater headquarters and enforced by engineer staff sections and commanders at lower levels.

c. *Engineer Local Procurement.* Local procurement by engineers often involves using the output of industrial plants in the theater of operations and may involve taking over such plants and supervising their operation and maintenance. Probably the most common forms of local procurement are the use of sand and gravel sources and the quarrying of rock. Another is the exploitation of forests by engineer forestry units.

12-14. Water Supply

ENCOM is responsible for furnishing potable and nonpotable water to installations in the COMMZ. The water supply company, TOE 5-67, (assigned to the ENCOM) provides nine water supply teams. The engineer construction battalion provides two water points for supplying potable and nonpotable water in support of battalion construction operations and potable water for other units as required. The water supply personnel of the utilities section of the construction battalion headquarters company set up water supply points. The source of the water dictates the type of treatment, and theater of operations regulations establish the purification standards. SOLOG 125 states minimum potability standards for field water supply. Rationing of water is a command function, and the battalions enforce limitations of water consumption on orders from higher authority. Where the situation dictates, engineer well-drilling teams, TOE 5-520, may be employed to develop subsurface water sources, or improve existing sources by the installation of well casings, pumping units or related hardware. In either case, commanders should be advised that engineer well-drilling teams rely upon the supported unit to provide the necessary supply support to obtain items such as well casing and pipe, pump assemblies, drilling additives, and other related items of equipment not organic to the teams.

Section IV. MAINTENANCE

12-15. Categories of Equipment Maintenance

a. There are four categories of maintenance as follows (AR 750-1) :

- (1) Organizational maintenance.
- (2) Direct support maintenance.
- (3) General support maintenance.
- (4) Depot maintenance.

b. The scope of the tasks assigned to each of these categories of maintenance are shown in the maintenance allocation chart in the appropriate equipment technical manual.

c. Organizational maintenance is performed by all using units. See FM 29-2 for a description of the total maintenance system and the basic techniques for the accomplishment of organizational maintenance. Units having limited and integrated direct support maintenance capabilities should use FM 29-24 and FM 29-30 as guidance for support operations. When a unit is authorized and capable of performing maintenance other than organizational maintenance, it will be so indicated in the TOE under the capability statement. Each commander is responsible for the maintenance of the equipment assigned to his unit.

d. An effective maintenance program depends upon accurate, complete, and timely preparation, maintenance, and submission of equipment rec-

ords. Details on records associated with equipment maintenance and their preparation, processing, and disposition are contained in TM 38-750. TM 38-750-1 provides guidance for units equipped with ADP and using automated maintenance procedures.

12-16. Responsibility

Responsibility for maintenance and care of equipment exists at all levels of command and extends to the individual operator. Each commander is responsible for the planning and organization of an effective maintenance system and for the training, indoctrination, inspection, and coordination of his command to insure careful use of equipment and satisfactory maintenance (DA Pam 750-1). Higher commanders and their staffs and inspection teams frequently inspect the equipment and assist in maintenance problems. Specialized maintenance units perform maintenance of a higher order than the organizations can accomplish; but this does not relieve the commander of his responsibilities. For specific instructions on maintenance of engineer equipment, see the technical manual written for the specific piece of equipment. See FM 29-24 for a complete description of the maintenance support system in a theater of operations and details on how direct and general support maintenance are provided.

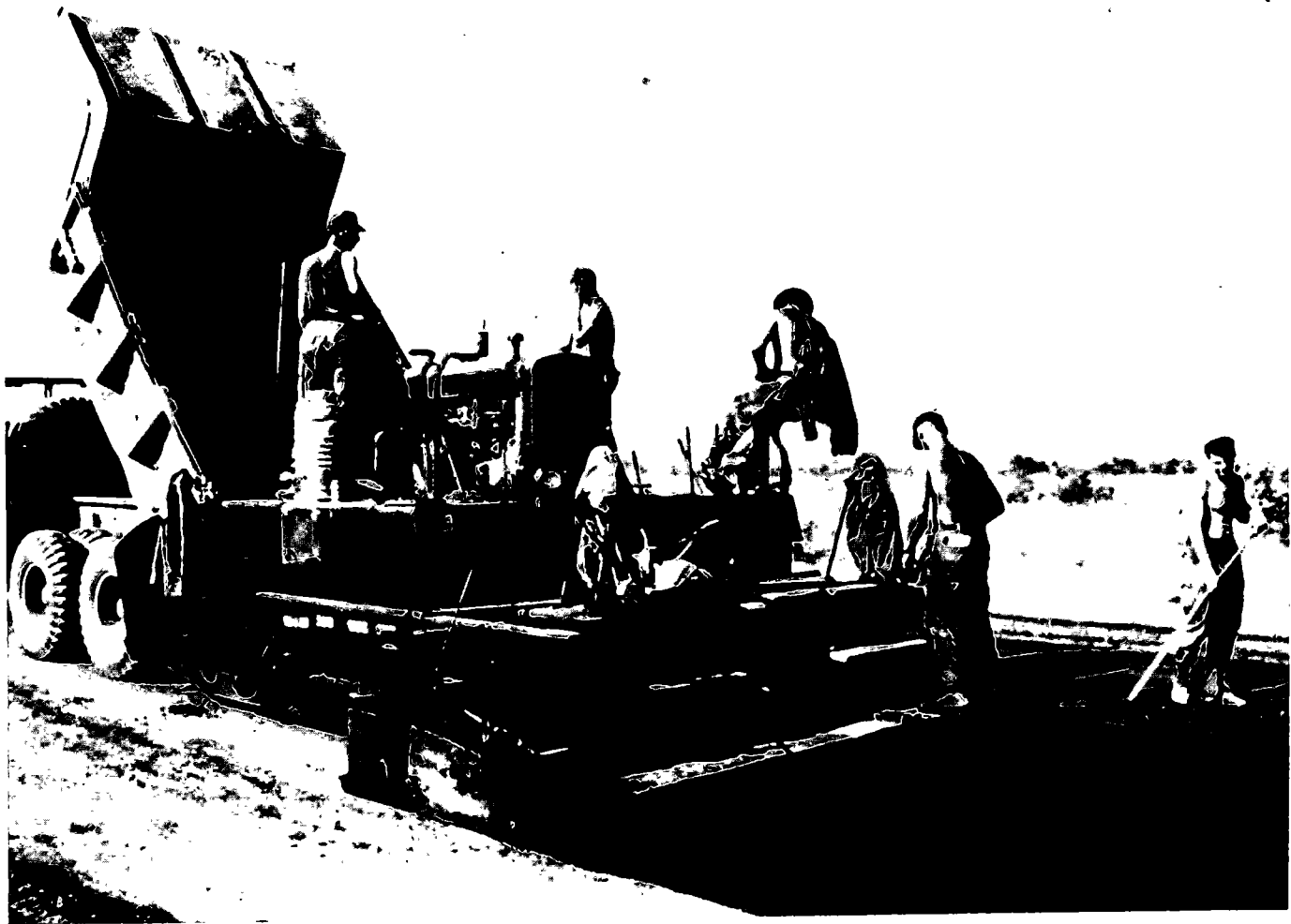


Figure 12-1. Asphalt paving operation; line-of-communication up grading.



Figure 12-2. Engineer port construction company preparing a bridge protective system to aid in bridge security.

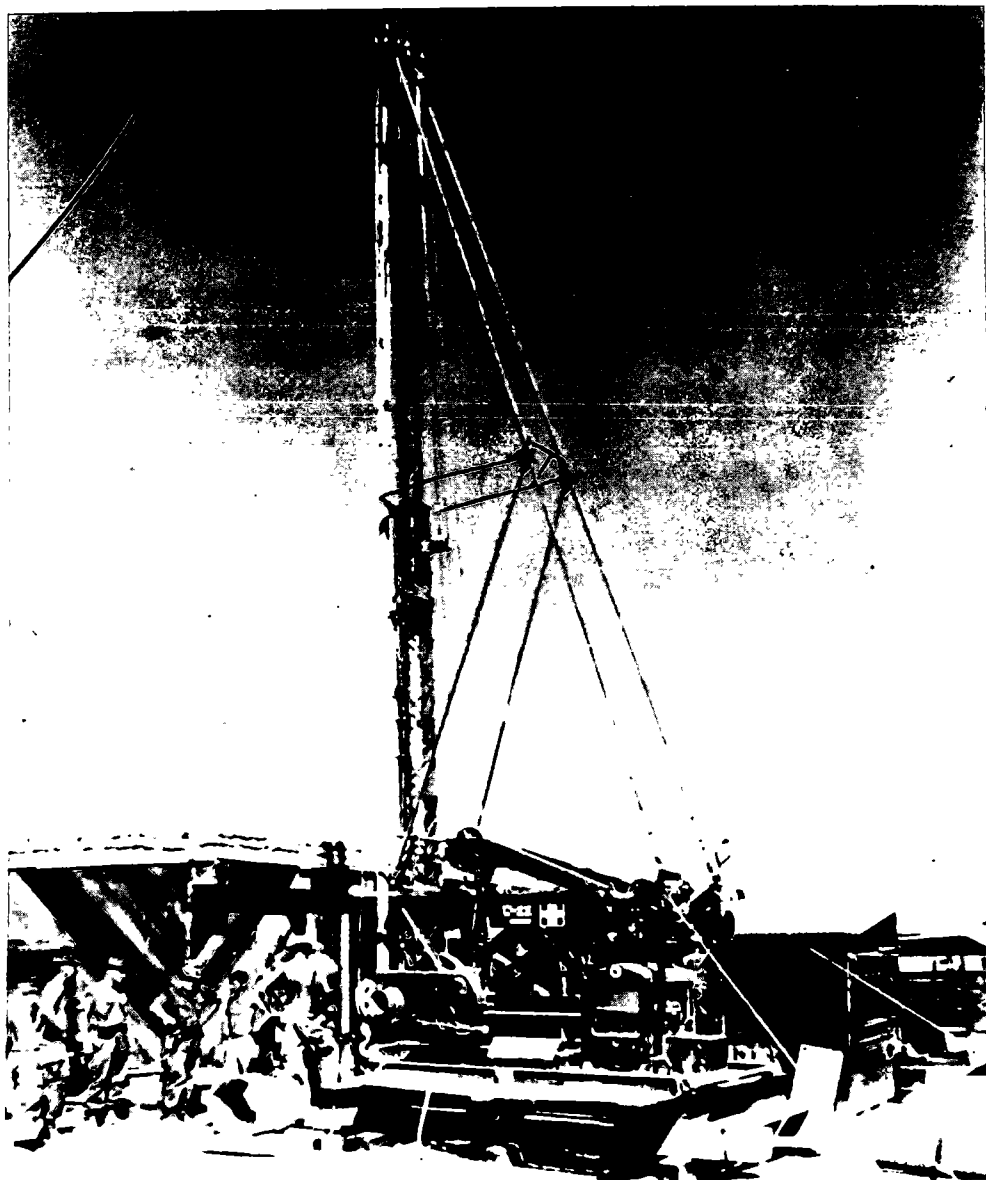


Figure 12-3. Well drilling equipment in operation to develop a source of water supply.

CHAPTER 13

TRAINING

Section I. GENERAL

13-1. General

a. The success of an army in a theater of operations depends largely upon the caliber of training required and provided to individuals and units. For this reason, construction and construction support units must be thoroughly motivated and trained in the accomplishment of their primary mission. They should also have instruction in the following as required:

- (1) Construction of field fortifications and protective construction.
- (2) Mine laying—mechanically or by hand—to include enemy mine warfare to permit successful countermining.
- (3) Special weapons effects.
- (4) Denial operations and barriers, to include conventional demolitions.
- (5) Suspension of engineer activities and rapid deployment to conduct combat operations or provide close support to combined or joint combat operations.
- (6) CBR defensive operations.
- (7) Administration, supervision, and training of indigenous labor.

b. Decentralization and the ensuing relative autonomy of smaller units make training of the platoons and companies for independent operations mandatory. Job organization for round-the-clock operations, emphasizing the conduct of engineering tasks during darkness and under extreme or unusual conditions, is an important part of all engineer unit training.

c. Engineer training gives special attention to the use of hand and power tools, heavy construction equipment, and specialized equipment for use in denial and barrier operations. Such training should include added emphasis on the supervision and performance of maintenance on engineer, power generation, and ordnance equipment and vehicles.

d. At all levels, Surveillance, Target Acquisition, and Night Observation (STANO) and countersurveillance training, including camouflage, detection, employment and breaching of deceptive or detection devices, is integrated with all other training.

e. All engineer troops are instructed in the importance of seeking, observing, and rapidly reporting information of an engineering nature to insure the prompt development of engineer intelligence. Some individuals are technically trained in the production and use of engineer intelligence.

f. Combat engineer units are trained to fight as infantry units. All other engineer units are trained to protect themselves from local ground attack, or as the situation dictates as denoted in paragraph *a.*(5) above.

13-2. Responsibility

a. The engineer command commander, and the engineer construction brigade commander, through their operations officers, are responsible for implementing Department of the Army training policies and directives; conducting specific training as necessary; determining and performing training requirements generated by operational missions; and maintaining their subordinate units at the peak of operational readiness.

b. The engineer construction group commander, through his operations officer, is responsible for coordinating the training programs of his entire group. This includes the coordination of the various training schedules, the use of training areas, and the use of training aids and facilities. The group operations section plans and prepares the training programs of the headquarters and headquarters company and attached separate companies, and is responsible for inspecting the training programs of the attached construction battalions.

c. The construction battalion commander is re-

sponsible for the training of the organic units of his battalion in the operations for which they are organized. Assisted by his S3 and operations section, and under the broad and general guidance of the group S3, he plans, directs, conducts, and supervises the training of his units. In accordance with the directives and policies issued by higher headquarters, he prepares master training schedules, designating the time to be spent on specified subjects; assigns responsibility for the conduct of the training; insures the use of performance and proficiency standards consistent with those of higher headquarters; and procures and controls

the use of training facilities, aids, and equipment. He is responsible for organizing and supervising battalion schools and determining student quotas of subordinate units for attendance at service or specialist schools conducted by higher headquarters. As necessary, he issues training directives regarding the type of instruction or information to be given. The construction battalion commander should utilize the various members of his staff to assist him in the planning and supervision of those particular aspects of training pertaining to the staff officers' specialized fields of responsibility.

Section II. ARMY TRAINING PROGRAM

13-3. General

The training being conducted by the Army at a given period can be appropriately placed into one of three categories—individual training, unit training, or combined training. Training may be subdivided into two stages, the cycle training and the post-cycle or operational readiness training.

13-4. Army Training Program Cycle Training

The five formal phases of cycle training in sequence of conduct are as follows:

a. Basic Combat Training (BCT) Phase. The basic combat training phase is the first part of individual training and transforms the untrained recruit into a basic soldier. Basic training is conducted in accordance with ATP 21-114.

b. Advanced Individual Training (AIT) Phase. The second part of individual training is the advanced individual training phase which includes training to qualify the soldier in branch material subjects and the skills he must know to effectively perform in the military occupational specialty (MOS) authorized by the TOE. Advanced individual training for engineer construction troops is outlined in ATP 5-114.

c. The Basic Unit Training (BUT) Phase. The basic unit training phase is conducted to integrate individuals into effective working teams of squads, sections, platoons, and companies for the performance of both combat and noncombat tasks.

d. The Advanced Unit Training (AUT) Phase. This phase integrates the company-size teams, now fully capable of accomplishing their TOE missions, into the coordinated units (battalion, group, or brigade) within their respective branches.

e. The Field Exercises and Maneuvers Phase. This phase provides for the training of large units on the ground under simulated combat conditions.

13-5. Operational Readiness Training

Operational readiness training is the sixth phase of training and is begun when a unit has satisfactorily completed its Army Training Test (ATT) and is awaiting movement to a combat zone. The objectives during this cycle are to—

a. Correct deficiencies noted during the conduct of cycle training.

b. Develop and maintain the unit at a peak of operational proficiency.

c. Perfect the unit's proficiency in the conduct of special exercises.

13-6. Training Management

The commander, in discharging his responsibility for training, makes use of the many training publications and aids provided for his guidance by the Department of the Army. Assisted by his staff, he plans, directs, and supervises the training program using this literature to guide and assist in the development and execution of effective procedures in training management. In addition to the Army regulations that state board training policies and requirements, he and his staff must be familiar with the following training publications concerning the appropriate unit:

a. Army Training Program (ATP). ATPs outline minimum essential training for units and individuals of the Active Army and Reserve Components. They prescribe subjects, hours to be devoted to each subject, and applicable supporting

Army Subject Schedules. The ATP normally concludes with an ATT. With battalion or larger size units, it occurs at the end of AUT; for separate companies the training is completed with BUT after which the ATT follows.

b. Army Subject Schedules (ASubjScd).

(1) Army Subject Schedules provide detailed guidance to instructors for the preparation of lesson plans and the scheduling of branch, general, or military occupational speciality training, in a particular subject as outlined in the Army Training Programs.

(2) MOS Army Subject Schedules outline instructions to be performed in training centers or units to develop proficiency in individuals according to the requirements of the MOS code (AR 611-201).

c. Training Circulars. Training circulars promulgate training directives, policies, or information of an interim nature which requires too frequent revision for inclusion in training literature. They are also used to promulgate new training doctrine, tactics, or techniques for immediate dissemination.

d. Army Training Tests (ATT). ATTs provide guidance for testing individuals and units under simulated combat conditions to evaluate their ability to perform assigned missions, and to evaluate the ability of the soldier to apply the minimum skills requisite to success in battle.

e. Training Directive. A training directive is an all-inclusive term given to oral instructions or written training publications that are of a directive nature, regardless of contents or publishing

headquarters. Generally, a directive establishes a definite policy or orders that a specific requirement or specific objectives be accomplished. Training directives include such publications as training memorandums and training schedules.

f. References. See FM 21-5 and FM 21-6 for more details.

13-7. Training in the Administration, Supervision, and Employment of Indigenous Labor

a. Commanders, staffs and members of engineer units must receive training in the proper administration, supervision, and employment of indigenous labor. The level and extent of training will be dictated by several factors, but should, as a minimum, include the following:

(1) Familiarity with international and United States policies governing indigenous populations.

(2) The importance of recognizing customs, beliefs, religion, and history of indigenous personnel.

(3) Supervisory techniques and situations common to indigenous groups.

(4) Job motivational techniques, their application and evaluation.

(5) Training and performance evaluation of indigenous labor forces.

(6) Requirement for language proficiency, language barriers, and spoken communications with indigenous groups.

b. For more details see DA Pam 690-80.



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APPENDIX A

REFERENCES

A-1. Army Regulations (AR)

1-35	Basic Policies and Principles for Interservice and Interdepartmental Logistic Support.
27-20	Investigation and Processing of Claims.
55-650	Military Railroads.
310-31	Management System for Tables of Organization and Equipment (The TOE System).
310-49	The Army Authorization Documents System (TAADS).
310-25	Dictionary of United States Army Terms.
310-50	Authorized Abbreviations and Brevity Codes.
380-5	Department of the Army Information Security Program.
385-40	Accident Reporting and Records.
385-55	Prevention of Motor Vehicle Accidents.
415-16	Army Facilities Components System.
415-36	Peacetime Planning and Construction in Overseas Base Rights Areas Garrisoned on Temporary Basis.
420-13	Organization, Functions and Utilization of Personnel.
420-17	Work Management.
611-101	Manual of Commissioned Officer Military Occupational Specialties.
611-112	Manual of Warrant Officer Military Occupational Specialties.
611-201	Enlisted Military Occupational Specialties.
703-1	Petroleum Supply and Management Activities.
710-2	Materiel Management for Using Units, Support Units, and Installations.
725-50	Requisitioning, Receipt, and Issue System.
750-1	Army Materiel Maintenance Concepts and Policies.

A-2. Department of the Army Pamphlets (DA Pam)

5-2	Improvement Tools for Soldier Managers; Management Practices in TOE Units (MAP-TOE).
108-1	Index of Army Films, Transparencies, GTA Charts and Recordings.
310-series	Index of Military Publications.
525-6	Military Operations Land Clearing.
690-80	Use and Administration of Local Civilians in Foreign Areas During Hostilities.
750-1	Preventive Maintenance Guide for Commanders.

A-3. Field Manuals (FM)

3-8	Chemical Reference Handbook.
3-10	Employment of Chemical and Biological Agents.
3-12	Operational Aspects of Radiological Defense.
5-1	Engineer Troop Organizations and Operations.
5-15	Field Fortifications.
5-20	Camouflage.
5-25	Explosives and Demolitions.

5-26	Employment of Atomic Demolition Munitions (ADM).
5-30	Engineer Intelligence.
5-34	Engineer Field Data.
5-35	Engineers' Reference and Logistical Data.
5-36	Route Reconnaissance and Classification.
5-142	Nondivisional Engineer Combat Units.
5-146	Engineer Topographic Units.
8-10	Medical Support Theater of Operations.
9-6	Ammunition Service in the Theater of Operations.
9-14	Explosive Ordnance Disposal Service.
10-67	Petroleum Supply in Theaters of Operations.
11-23	US Army Strategic Communications Command (Theater).
16-5	The Chaplain.
19-25	Military Police Traffic Control.
20-32	Landmine Warfare.
20-33	Combat Flame Operations.
21-5	Military Training Management.
21-6	Techniques of Military Instruction.
21-26	Map Reading.
21-30	Military Symbols.
21-31	Topographic Symbols.
21-40	Chemical, Biological, and Nuclear Defense.
23-12	Techniques of Fire of the Rifle Squad and Tactical Application.
23-65	Browning Machine Gun, Caliber .50 HB, M2.
24-18	Field Radio Techniques.
24-20	Field Wire and Field Cable Techniques.
29-2	Organizational Maintenance Management.
29-24	General Support Maintenance Battalion.
29-30	Maintenance Battalion and Company Operations in Divisions and Separate Brigades.
30-16	Technical Intelligence.
31-10	Denial Operations and Barriers.
31-16	Counter guerrilla Operations.
31-22	US Army Counterinsurgency Forces.
31-23	Stability Operations, US Army Doctrine.
31-25	Desert Operations.
31-35	Jungle Operations.
31-50	Combat in Fortified and Built-up Areas.
31-70	Basic Cold Weather Manual.
31-71	Northern Operations.
31-72	Mountain Operations.
31-82	Base Development.
31-85	Rear Area Protection.
41-10	Civil Affairs Operations.
44-1	US Army Air Defense Artillery Employment.
54-2	The Division Support Command.
54-3	The Field Army Support Command.
54-7	The Theater Army Support Command.
55-1	Army Transportation Services in a Theater of Operations.
60-30	Embarkation and Loading—Amphibious.
100-5	Operations of Army Forces in the Field.
100-10	Combat Service Support.
100-15	Larger Units Theater Army—Corps.
(C)100-20	Field Service Regulations—Internal Defense and Development (IDAD) (U).

101-5
101-10-1

Staff Officers' Field Manual; Staff Organization and Procedure.
Staff Officers' Field Manual—Organizational, Technical, and Logistical
Data, Unclassified Data.

A-4. Technical Manuals (TM)

3-210	Fallout Prediction.
3-220	Chemical, Biological, and Radiological (CBR) Decontamination.
3-221	Field CBR Collective Protection.
5-200	Camouflage Materials.
5-220	Passage of Obstacles Other Than Minefields.
5-227	Design and Techniques of Military Civic Action.
5-230	General Drafting.
5-232	Elements of Surveying.
5-233	Construction Surveying.
5-235	Special Surveys.
5-248	Foreign Maps.
5-258	Pile Construction.
5-297	Well Drilling Operations.
5-300	Real Estate Operations in Overseas Commands.
5-301	Staff Tables of Engineer Functional Components System.
5-302	Construction in the Theater of Operations.
5-303	Bills of Materials and Equipment of the Engineer Functional Components System.
5-311	Military Protective Construction (Nuclear Warfare and Chemical and Biological Operations).
5-312	Military Fixed Bridges.
5-330	Planning, and Design of Roads, Airbases, and Heliports in the Theater of Operations.
5-331A	Utilization of Engineer Construction Equipment, Volume A—Earthmoving, Compaction, Grading, and Ditching Equipment.
5-331B	Utilization of Engineer Construction Equipment, Volume B—Lifting, Loading, and Hauling Equipment.
5-331C	Utilization of Engineer Construction Equipment, Volume C—Rock Crushers, Air Compressors, and Pneumatic Tools.
5-331D	Utilization of Engineer Construction Equipment, Volume D—Asphalt and Concrete Equipment.
5-331E	Utilization of Engineer Construction Equipment, Volume E—Engineer Special Purpose and Expedient Equipment.
5-332	Pits and Quarries.
5-333	Construction Management.
5-335	Drainage Structures, Subgrades, and Base Courses.
5-337	Paving and Surfacing Operations.
5-343	Military Petroleum Pipeline Systems.
5-349	Arctic Construction.
5-360	Port Construction and Rehabilitation.
5-370	Railroad Construction.
5-441	Geodetic and Topographic Surveying.
5-530	Materials Testing.
5-545	Geology.
5-551B	Carpenter.
5-600-series	Facilities Engineering.
5-700	Field Water Supply.
5-704	Construction Print Reading in the Field.
5-725	Rigging.
5-742	Concrete and Masonry.

5-800-series	Engineering and Design.
9-1300-206	Care, Handling, Preservation and Destruction of Ammunition.
9-1300-214	Military Explosives.
10-1109	Organizational Maintenance: Military Petroleum Pipelines, Tanks, and Related Equipment.
38-750	The Army Maintenance Management System (TAMMS).
38-750-1	The Army Maintenance Management System (TAMMS) Field Command Procedures.

A-5. Army Training Programs (ATP)

5-114	Engineer Construction Battalion and Construction Support Units.
21-114	Male Military Personnel Without Prior Service.

A-6. Tables of Organization and Equipment (TOE)

5-67	Engineer Water Supply Company.
5-111	Headquarters and Headquarters Company, Engineer Construction Brigade.
5-112	Headquarters and Headquarters Company, Engineer Construction Group.
5-114	Engineer Construction Support Company.
5-115	Engineer Construction Battalion.
5-116	Headquarters and Headquarters Company, Engineer Construction Battalion.
5-117	Engineer Equipment and Maintenance Company, Engineer Construction Battalion.
5-118	Engineer Construction Company, Engineer Construction Battalion.
5-124	Engineer Dump Truck Company.
5-129	Engineer Company, Port Construction.
5-177	Engineer Pipeline Construction Support Company.
5-201	Headquarters and Headquarters Company, Engineer Command.
5-305	Engineer Topographic Battalion, Army.
5-327	Engineer Topographic Company.
5-346	Headquarters and Headquarters Detachment, Engineer Base Topographic Battalion.
5-347	Engineer Base Reproduction Company.
5-348	Engineer Base Survey Company.
5-349	Engineer Base Photomapping Company.
5-500	Engineer Admin and Headquarter's Teams (Administrative and Headquarters Teams).
5-510	Engineer Firefighting Teams
5-520	Engineer Equipment Operating Teams.
5-530	Engineer Construction, Utilities and Electrical Power Teams.
5-540	Engineer Topographic and Intelligence Teams.
5-550	Engineer Dredge Teams.
5-560	Engineer Civic Action Teams.
9-500-series	Ordnance Service Organizations.
11-147	Signal Small Headquarters Operations Company.
12-67	Personnel Service Company.
55-19	Transportation Car Company, Army, Logistical Command or Airborne Corps.

A-7. Other References

STANAG 2041	Operational Road Movement Orders, Tables and Graphs.
STANAG 2079	Rear Area Security and Rear Damage Control.
DOD 4270.1-M	Department of Defense Construction Criteria Manual.
(C)JCS PUB 3.	Joint Logistics and Personnel Policy and Guidance (U).

APPENDIX B

AUTOMATIC DATA PROCESSING SYSTEM, ENGINEER COMMAND

B-1. General

This appendix describes the application of current automatic data processing systems (ADPS) to engineer command operations and describes the procedures to be employed during operations where ADPS is unavailable, damaged, or otherwise inoperable. The current ADPS used by the engineer command in a theater of operations may be adaptable to and may eventually be incorporated into the combat service support (ADP) system (CS₃). Expansion of the current system, to increase operational efficiency of the engineer command, will be included in the CS₃ program.

B-2. Application of ADP Support to Engineer Construction Operations

a. The Army facilities components system (AFCS) is a military engineering construction support system for use in a theater of operations. It is composed of planning guidance (TM 5-301), drawings (TM 5-302), bills of material and equipment augmentations (TM 5-303), and listings in automated files describing preengineered, prefabricated, and relocatable facilities, buildings, and other structures and works commonly required by land-based military forces for base development, line-of-communication activities, and tactical operations. The AFCS can be used at any echelon for engineer planning, operations, and requisition of construction materials with or without ADP assistance. The AFCS provides a catalog of facilities which can be selected to satisfy the construction requirements of a military function, organization, or activity in various environments and to satisfy the standard of construction specified by the joint or major Army commander. Construction, logistic and cost data in the system are catalogued to permit exploitation of ADP equipment to reduce time and effort for planning and for requisitioning material. The AFCS provides construction, logistic, and planning data for:

(1) Preparation, support, and execution of base development plans.

(2) Preparation of operational projects for Class IV base development construction materials.

(3) Estimating materials, costs, manpower, and tonnages required to be moved in theater and for military engineering support of military operations.

(4) Guidance to construction organizations as to site layouts, construction and erection details, bills of materials, construction effort, and equipment.

(5) Climatic options in facility designs suitable for use in temperate, tropical, desert, and arctic environments.

(6) Options in construction standards suitable for phased development or improvement of operational facilities or for tailoring initial standards of construction to the availability of construction materials and effort.

b. *Application of ADP to the AFCS.* The AFCS, with the exception of drawings in TM 5-302, is recorded on magnetic tapes. This data bank is updated monthly by the Office of the Chief of Engineers utilizing the Army master data file (AMDF) which is fully automated with the Army materiel command catalog data office (AMMCCDO). Duplicate magnetic tapes of the AFCS data bank are provided the US Army Mobility Equipment Command for use in their computer to identify and process requisitions from the field employing AFCS installation and facility numbers. Additionally, duplicate magnetic tapes, card decks, and computer print-outs are available from HQDA (DAEN-MEF) upon request for major Army commands, logistic commands and field users. This procedure enables computers in the field to interface with the US Army Mobility Equipment Command so that at any echelon AFCS-coded requisitions can be either filled or forwarded. An example of this procedure as employed in the US Army, Pacific, is shown in figure B-1.

B-3. Limitation of Current System

As now used, automated processing of AFCS data, in the theater of operations and CONUS, simplifies supply requisitioning and expedites delivery of construction material to the theater. However, the system has limitations which prevent fully automated support of construction operations as follows:

a. The AFCS, with standard design and bills of material, does not permit automated substitution of design or material. Substitutions must be made manually at using unit level using current supply catalogs.

b. Engineers in the field must perform repetitive and sometimes complex engineering calculations manually. Although many civil engineering computer programs are now available, current ADPS in theaters of operations do not use the formula translation (FORTRAN) language common to these programs.

c. Construction management data processing (including program evaluation, progress and completion reports, and troop status reports) is performed manually. Eventually expansion of the theater ADPS under the TASTA-70 program may allow for computerization of these tasks using computers of the ASCOM.

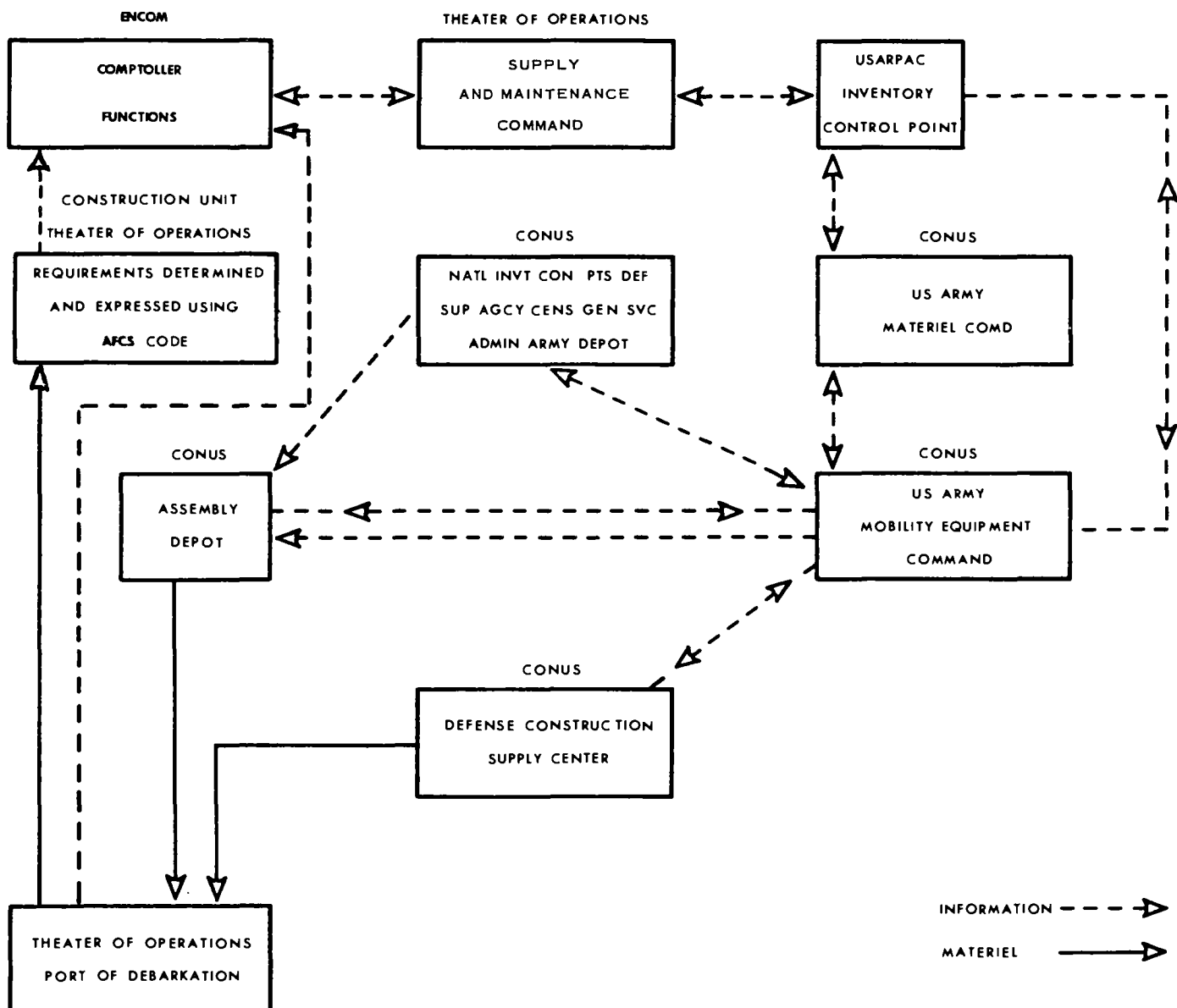


Figure B-1. Supply procedures for Army troop construction in Southeast Asia.

B-4. ADP Support for Topographic Operations

a. General. Topographic support in and to the theaters of operation makes use of ADPS in two major functions as follows:

(1) Survey computations necessary to provide geodetic control and cartographic data. When appropriate program tapes have been standardized and issued, these computations will be performed on the field artillery digital automatic computer (FADAC) which is organic to the engineer base survey company (TOE 5-348), engineer topographic company (TOE 5-327), and the engineer topographic battalion (Army) (TOE 5-305).

(2) Map distribution, including requisition and inventory control. Map distribution is partially automated with a computer at US Army Topographic Command (USATOPOCOM) and with ADP equipment available to topographic map inventory control points (TMICP) in all theaters. USATOPOCOM is designated as the National Topographic Inventory Control Point and interfaces with theaters of operations topographic map inventory control points, worldwide, tying together the US Army Map Distribution Organization.

b. ADP Applications to US Army Map Distribution. Theaters of operation TMICPs operated by engineer base topographic battalions, or their equivalents, have access to automatic data processing equipment to perform their functions at the present time but do not have organic or sole user capability. Map depots and other in-theater topographic units rely upon manual data processing.

B-5. Future Uses of ADPS for the Engineer Command

a. Upon attainment of the recommended functional applications for CS₃, TASTA-70, the engineer command, using the area support command's CS₃ (or an appropriate substitute computer system) may have the capability to perform—

- (1) Troop operations planning.
- (2) Limited construction design.
- (3) Modification design.
- (4) Construction supply requisitioning.
- (5) Map distribution, requisitioning inventorying.

b. To obtain full utilization of planned engineer construction support functional applications, it is envisioned that each group and battalion will have a remote input/output device capable of providing reports like those in figures B-2 and B-3.

B-6. Procedures When ADPS is Inoperable

In the event of destruction or damage to ADP support, construction and topographic units would continue using manual procedures. To insure a smooth transition from an automated system to a manual system, the engineer command should establish standing operating procedures detailing format and frequency for reports, and other administrative actions in the area of construction and topographic support. For design and construction materials requisitioning, engineer units continue to rely on the AFCS and normal engineer planning techniques.

PLEASE SIGN ON
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 DIALCOM TIME-SHARING
 PLEASE IDENTIFY YOUR PROJECT
 CPM
 ON AT 13:23 11/08/71
 ?CREATE FUSS

BEGIN
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?XBASIC CHECK/679

RUN

DEFINE FILE

1=FUSS

ACT	T	H	D
1	1	3	3
2	1	5	3
3	1	9	5
4	3	5	0
5	3	9	3
6	5	7	5
7	7	13	4
8	9	11	4
9	11	13	5

80 EXIT

?XBASIC CPM1/679

RUN

DEFINE FILE

1=FUSS

ENTER LARGEST EVENT #.

113

ENTER # OF ACTIVITIES.

19

BEFORE PRINTING TAB SHEET, DO YOU HAVE ANY
 MORE CHANGES? YOU MAY ADD, DELETE, OR CHANGE ANY ACTIVITY.
 !NO

YOU HAVE 1 DUMMIES AND 8 ACTIVITIES
 WHAT DO YOU WANT...GOOD GRAMMAR OR GOOD TASTE?

ACTIVITY NUMBER	EVENT NO. TAIL-HEAD	DURATION	EST	EFT	LST	LFT	TOTAL FLOAT	CRITICAL PATH
1	1- 3	3	0	3	0	3	0	YES
2	1- 5	3	0	3	3	6	3	NO
3	1- 9	5	0	5	1	6	1	NO
4	3- 5	0	3	3	6	6	3	NO
5	3- 9	3	3	6	3	6	0	YES
6	5- 7	5	3	8	6	11	3	NO
7	7- 13	4	8	12	11	15	3	NO
8	9- 11	4	6	10	6	10	0	YES
9	11- 13	5	10	15	10	15	0	YES

DO YOU WANT TO MAKE FURTHER ACTIVITY CHANGES AND
 HAVE A NEW TAB SHEET PRINTED OUT?
 !NO

TO OBTAIN A TAPE OF YOUR UPDATED AND SORTED DATA FILE, TYPE
 <PUNCH RITE> AFTER THE COMPUTER TYPES A <?>.

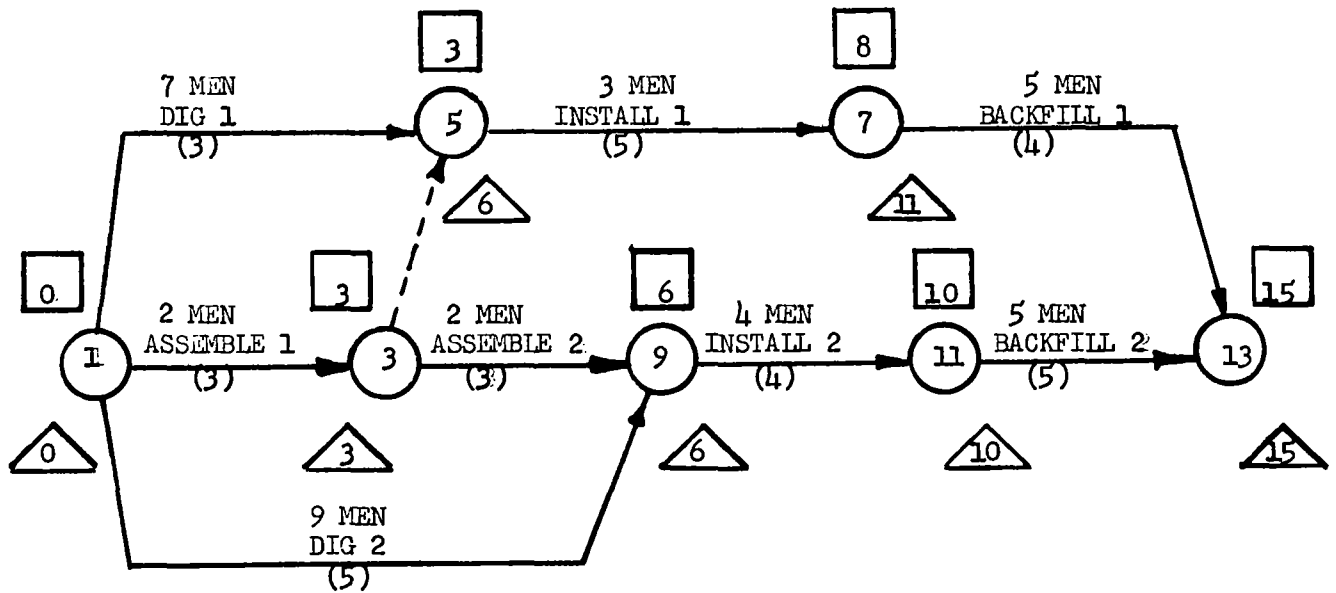
9000 EXIT

END

OFF AT 13:28 11/08/71
 COMPUTE SEC. - 03.1
 CONNECT MIN. - 05

Figure B-2. Type computer program for input/output of CPM information.

CPM NETWORK



ACTIVITY CHART FOR COMPUTATION/SCHEDULING

	DAY 1						DAY 2					
ACTIVITY												
1-3												
1-5												
1-9												
3-5												
3-9												
5-7												
7-13												
9-11												
11-13												

Figure B-3. CPM network and type recording for CPM computer output.



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APPENDIX C

CONCEPT AND ORGANIZATION FOR RPMA SUPPORT

C-1. General

Real property maintenance activities (RPMA) support in a theater of operations includes a number of tasks that vary greatly with the type unit(s) supported, the intensity of the conflict, and the environment. The capability developed to provide this support must be coordinated and efficiently linked with the total engineer resources available in the theater of operations (TO). RPMA must utilize modern operating and management systems and be able to readily adapt to changes in the type and degree of support required. The units proposed (the facilities engineering team, group and district) will serve as the basic framework upon which RPMA support for a particular contingency can be formed.

C-2. Objective

The objective of this RPMA support concept is to provide responsive, effective and efficient RPMA support in a TO.

C-3. Concept

This concept is based upon the experiences of Vietnam and Europe and is built upon the flexible use of the organizations presented in this appendix. The application of the concept is envisioned worldwide, via the use of the organizations summarized below.

a. Facilities Engineering Team—Fly Away Support Team for Contingency RPMA Engineer Support in a TO (FAST CREST).

(1) *Description.* This team will serve as the basic element for initial and immediate RPMA support for division-sized forces in a TO. A team will deploy with the division-sized force with a complete complement of TOE equipment and any specialized tools and equipment needed for the erection, operation, and maintenance of new or unique facilities. The team structure (fig. C-1) will provide for a maximum of operating craftsmen and a minimum of supervisory, management, and planning personnel. Planning will be limited

to that necessary to accomplish immediate tasks and reconnaissance/liaison to facilitate follow-on planning by elements of the facilities engineering group or others. The team will be assigned to the engineer command or engineer element supporting the TO, but will be under the operational control of the engineer of the division-sized force supported. Although this team will be capable of providing limited support for a sustained period, it will normally be replaced by the phased deployment of a facilities engineering group.

(2) *Capability.* The team will provide initial and immediate facilities engineering for division-sized contingencies or redeployment of division-sized forces in a TO. (If required subsequent full-scale and sustained support will be provided by deployment of a facilities group.) The team will perform the following representative tasks for which organic tool kits and airmobile equipment will be required:

- (a) Operation and maintenance of existing utilities (heating, air conditioning, electrical, and sewage plants).
- (b) Maintenance of existing buildings, structures, and roads.
- (c) Limited modification of facilities.
- (d) Fire prevention and protection.
- (e) Real property accounting and coordination of real estate acquisition.
- (f) Hire and supervision of civilian labor.
- (g) Purchase of local material.

b. Facilities Engineering Group.

(1) *Description.* This group will serve as the basic element for those installations/areas of a TO authorized sustained, full-scale RPMA support. A population of 15 to 20,000 can be supported. The group will be normally deployed in phases to an area served by a Fast Crest Team, but also can be deployed as the initial RPMA element in situations where there is sufficient advance notification. This organization will have a complete staff to plan, program, schedule, and

account for the complete range of facilities engineering activities of the installation or area concerned, and will have a full complement of operating craftsmen to execute RPMA tasks. It will take immediate advantage of local resources (material and manpower) and theater equipment pools to increase its basic capability as needed. As the operational situations and requirements warrant, this basic organization can be modified (MTOE); augmented by TOE units and service teams, TDA military and civilian complements, and contractor effort; or converted (MTDA/TDA) to a tailored organization to meet the needs of a particular installation or area. The group will be assigned to the engineer command (or engineer district of the engineer command) or engineer element supporting the TO. When required for proper control, the group will be under the operational control of the major force engineer (e.g., corps or field army engineer).

(2) *Capability.* The group will provide facilities engineering (fig. C-2) for installations and areas with populations of 15,000 to 20,000 as follows:

- (a) Fire protection and fire prevention programs.
- (b) Operation of central field water plants.
- (c) Real property accounting.

(d) Operation and maintenance of central electrical power plants.

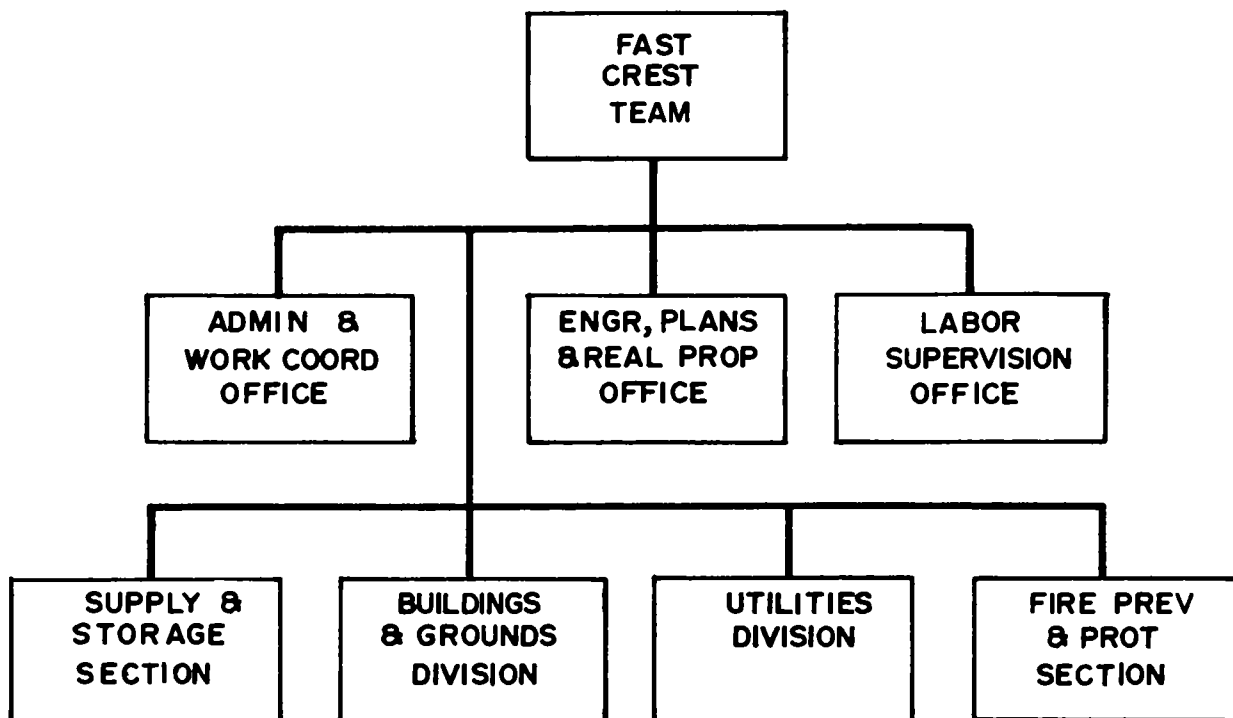
(e) Supervision of local labor and contractor effort.

c. Facilities Engineering District.

(1) *Description.* This district will provide the intermediate level of command, management, and administration necessary for the control of two to four facilities engineering groups. The district will have only those technical craftsmen necessary for the proper planning, supervision, inspection, and accounting of RPMA tasks. Modern sophisticated management systems will be employed to insure full utilization of RPMA resources, immediate response to emergencies, accounting for real property and money, long-range requirements and budget material planning, and manpower programming.

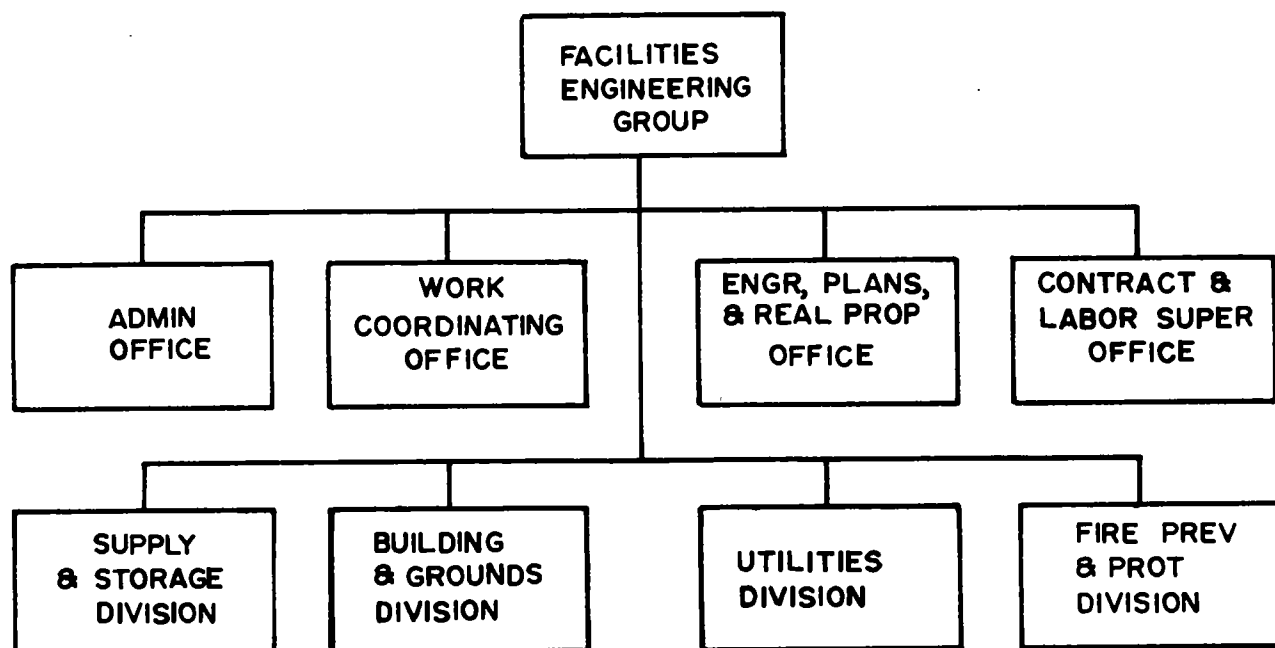
(2) *Capability.* The district will provide command and supervision of two to four facilities engineering groups and other attached or assigned units (fig. C-3) as follows:

- (a) Overall planning and directing of the facilities engineering effort.
- (b) Preparation of operational plans, project plans, designs, and construction directives.
- (c) Advice on facilities engineering and base development matters.



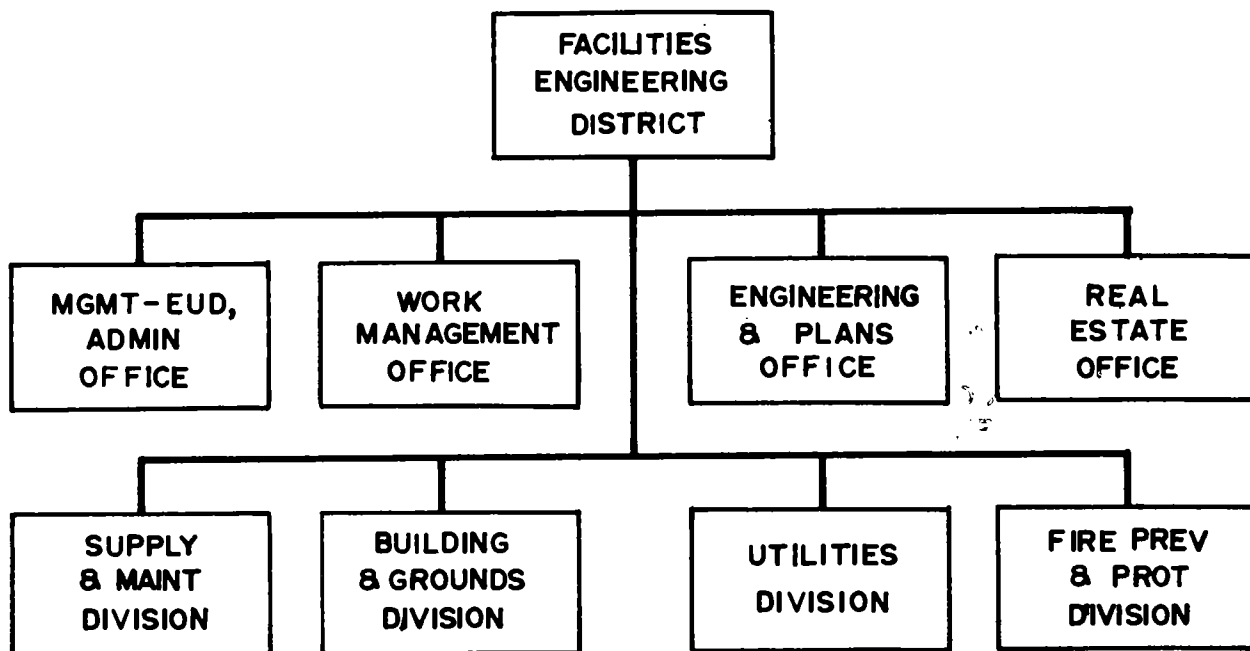
APPROXIMATE STRENGTH - 80

Figure C-1. Facilities engineering team (FAST CREST).



APPROXIMATE STRENGTH - 250

Figure C-2. Facilities engineering group.



APPROXIMATE STRENGTH-100

Figure C-3. Facilities engineering district.

(d) Acquisition, utilization and disposal of real property.

(e) Planning and direction of local labor and contractor effort.

(f) Coordination of facilities engineering supplies.

d. Theater Army RPMA Organization.
Figure C-4 shows a type organization for RPMA support in a typical Theater Army.

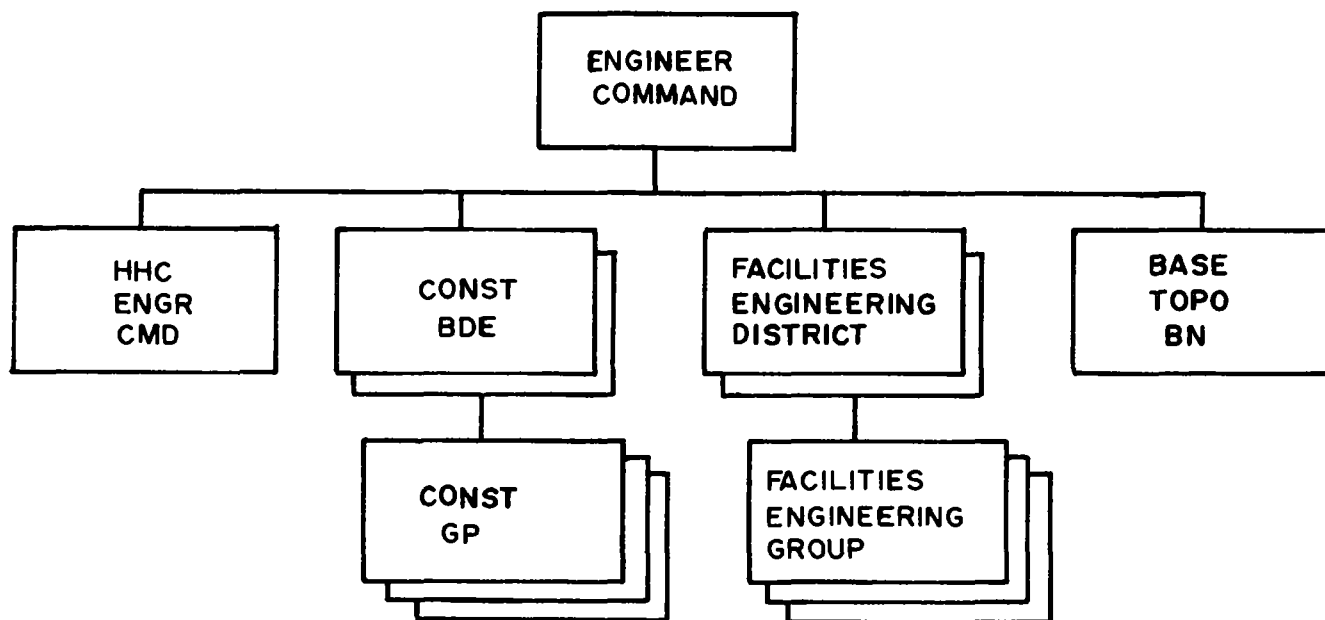


Figure C-4. Type organization for theater army RPMA.

APPENDIX D

SAMPLE CONSTRUCTION PLANNING AND MANAGEMENT FORMATS

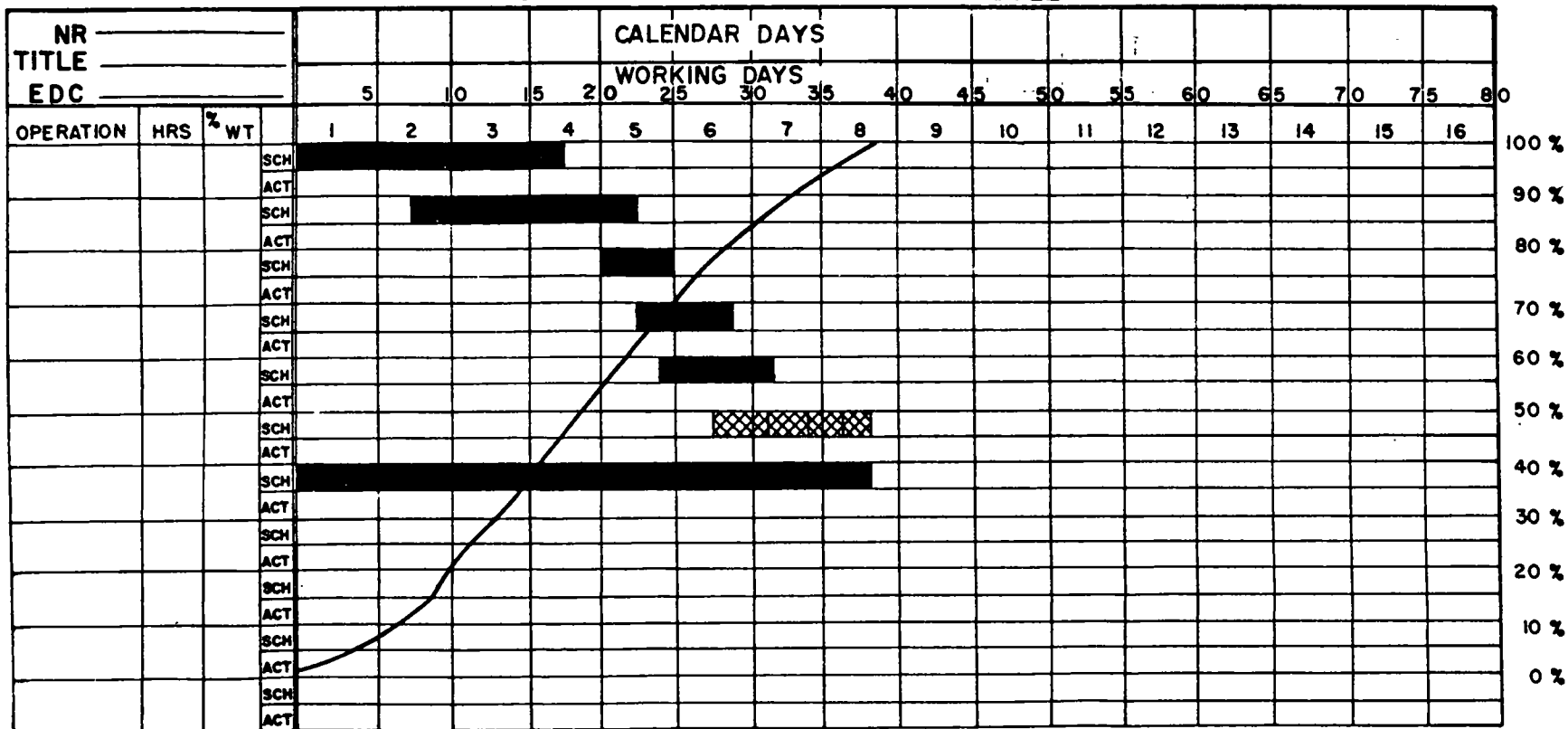
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Figure D-1. Sample activity estimate sheet for CPM.

[illegible]

Figure D-2. Completed activity estimate sheet for CFM.

CONSTRUCTION PROGRESS SCHEDULE

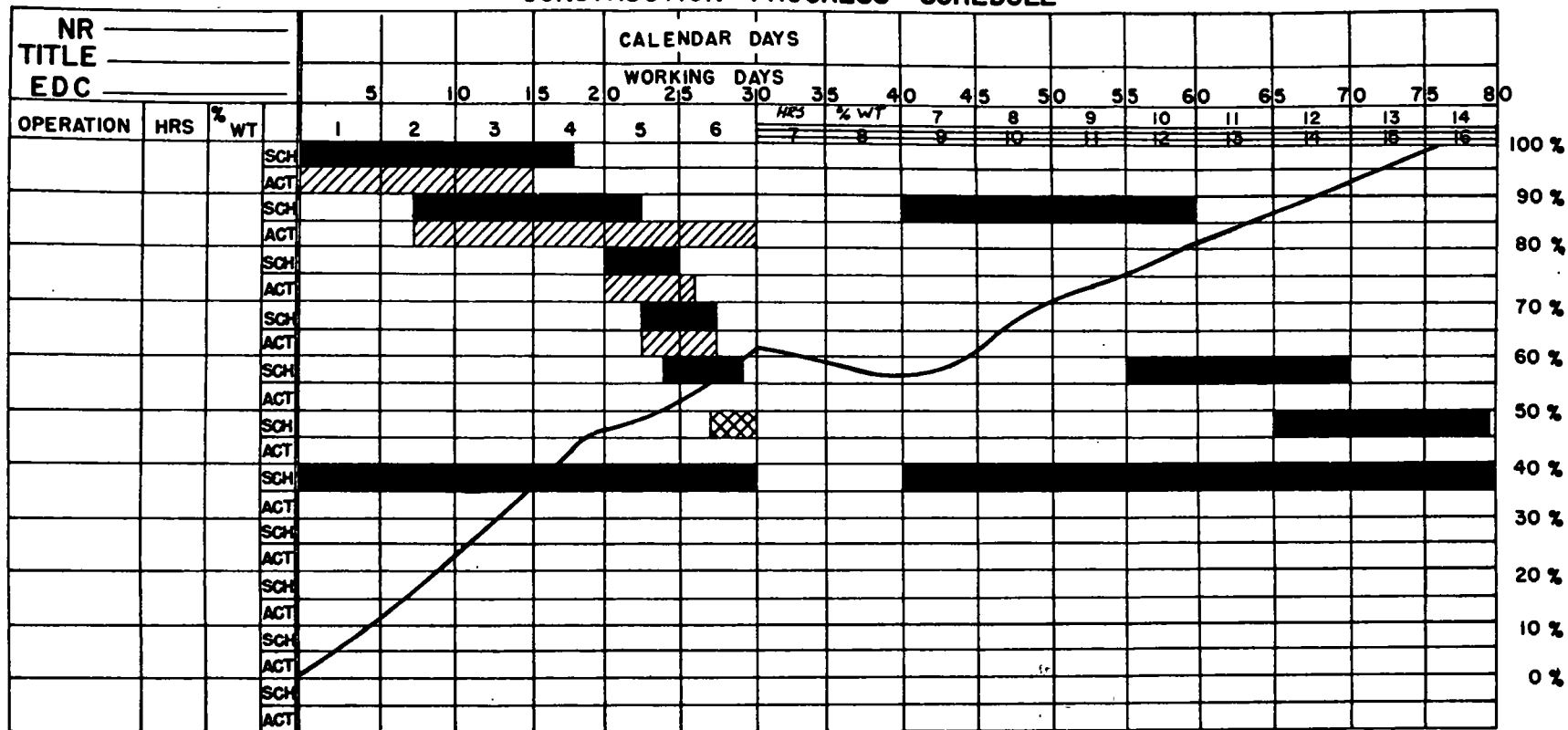


LEGEND.

- ██████████ - SCHEDULED
 ▨ - MATL FURN BY OTHERS

Figure D-8. Construction progress schedule, estimated time.

CONSTRUCTION PROGRESS SCHEDULE

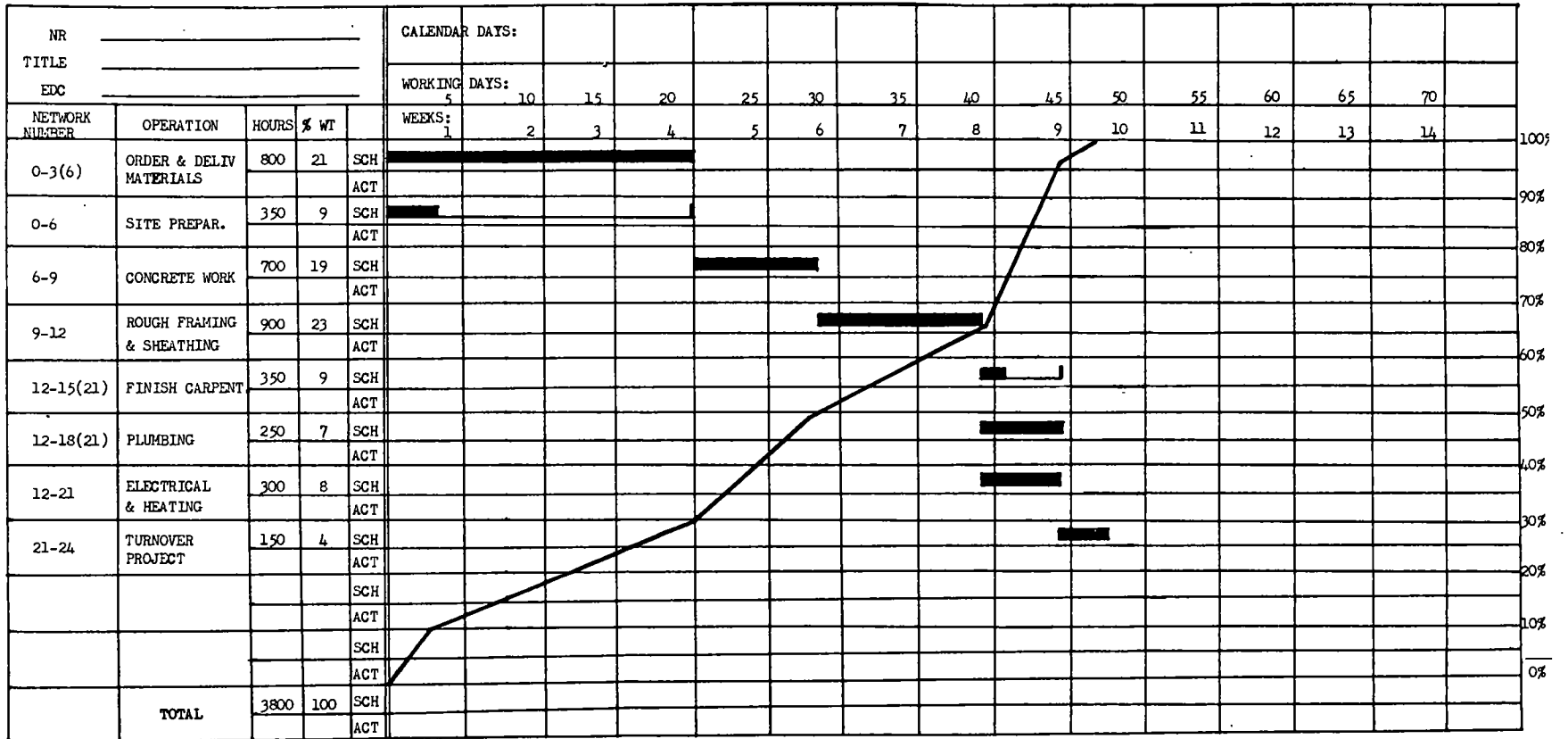


LEGEND

- SCHEDULED
- MATL FURN BY OTHERS
- ACTUAL

Figure D-3—Continued.

CONSTRUCTION PROGRESS SCHEDULE USING CPM

using CPM.
Figure D-8—Continued.

D-7

FM 5-162

HEADQUARTERS
 _____ ENGINEER GROUP

PROJECT INSPECTION REPORT

RCS _____

DATE OF INSPECTION		CONSTRUCTING UNIT CO & PL		PROJECT NR.		TITLE	
LOCATION		STARTING DATE		CURRENT EDC		PROGRESS SCH ACTUAL	
NR PERSONNEL SCH ACTUAL		EQUIPMENT EMPLOYED					
		1	2	3	4	5	
QUALITY CONTROL JOB MANAGEMENT ADHERENCE TO PLANS AND SPECIFICATIONS							1 - UNSATISFACTORY 2 - FAIR 3 - GOOD 4 - EXCELLENT 5 - SUPERIOR

REMARKS: To include all verbal agreements and decisions reached at site and confirmed hereby.

Figure D-5. Project inspection report.

HEADQUARTERS
ENGINEER GROUP
PROJECT STATUS REPORT

[illegible]

TROOP DISPOSITION REPORT

UNIT _____ DATE _____

ASGD STR _____ ATCHD _____ PRES FOR DUTY _____

2. OVERHEAD:

a. ABSENT		c. ADMINISTRATIVE OVERHEAD	AUTH	ACTUAL
TDY/DS		Administration		
Leave		Operations		
Pass		Supply		
Hospital & Quarters		Ord & Engr Maint		
Conf; AWOL		Drivers & Equip Operators in motor pool		
In Transit		Training		
Compensatory time				
Total				
b. DETAILS				
Kaserne Utilities				
Sick Call				
Processing				
Dental				
Guard				
CQ				
Kitchen Police				
School (ED Cen)				
Bks Orderly				
Total				

Figure D-7. Troop Disposition Report

11. EQUIPMENT AND HOURS USED:

Brief nomenclature (Note: Indicate by ** all support equipment)	EQUIPMENT HOURS EXPENDED	
	This Report	Total to Date

12. RECORD OF MANHOURS LOST _____ DATES _____

REASON:

13. REMARKS:

List all items which favorably or adversely affected the planned progress of this project during the reported period.

UNIT COMMANDER_____
BN S 3_____
TYPED_____
TYPED



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APPENDIX E

COMMUNICATIONS IN ENGINEER UNITS

E-1. General

Military operations cannot be carried on unless the commander can convey his orders to his subordinates and, in turn, receive information from them. With the exception of mail and personal interview, the means of doing this comes under the heading of signal communications. Communications are required within all engineer units for command and control. Normal requirements are met by the use of radio, wire, and messenger. Principal reliance will be on organic continuous wave and voice radio, with wire and messenger supplementing and alleviating radio traffic. Voice and record communications circuits will be available from the Army command and area communications systems. These are normally provided, and they provide communications with all organizations in the theater of operations.

E-2. Responsibilities

a. The establishment of communications is a command responsibility and the commander is responsible for—

(1) Establishing communications from the higher headquarters to the lower headquarters within the resources at his disposal.

(2) Establishing lateral communications from left to right unless a higher headquarters direct otherwise.

b. Normally, each engineer unit at battalion or higher command echelon is authorized a communications-electronics (C-E) staff officer by TOE. The C-E staff officer supervises the installation, operation, and maintenance of communications equipment, and is responsible to the commander for instituting and enforcing sound communications security practices throughout the unit. He advises the commander and staff in communications matters, submits recommendations for establishing communications systems, and drafts or secures Communications-Electronics Operations Instructions (CEOI) and Communications-Electronics Signal Instructions (CESI).

c. There are five means of communication:

- (1) Radio.
- (2) Wire.
- (3) Messenger.
- (4) Visual.
- (5) Sound.

E-3. Radio

Radio is the primary means of communication within engineer units. The extensive use of radio makes it necessary for all engineer personnel to have a general understanding of radio communications operations and procedures. Most of the radios in engineer units are voice radio sets, but radio teletype (RATT) and continuous wave (CW) operations are also used. Radio has distinct advantages over wire communications. Radio communications can be placed in operation quicker than wire circuits and get quicker response. Radios organic to engineer TOE units have limitations, however, such as transmission security, single-channel capacity requiring a net control station when more than two stations are in the net, and possible interference from enemy or friendly stations. Deliberate jamming may be offset by security measures and training in operating procedures. The range and reliability of radio communications depends upon such factors as the frequency, power, and location of the transmitter and receiver; the terrain; the weather; the technical proficiency of operating personnel; type of antenna used; and similar factors. Organic radio communications permit rapid reaction to changes in tactical situations and are the principal communications means which can be relied upon in a fluid situation. However, organic radio communications should be supplemented by organic wire systems connected to the area communications system as soon as possible. Personnel must be trained in the proper employment and procedure for the operation of these organic radio nets. Lack of training can result in unnecessary transmissions and a security violation, which in turn may

contribute to the loss of life. Radios which may be found in engineer units are listed in table E-1.

E-4. Wire

The use of wire is not only desirable, but necessary in certain engineer operations. During periods of radio silence, severe atmospheric interference, and enemy jamming operations, wire may become the primary means of communications and, therefore, is an essential component of the operational communications system of engineer units. In the COMMZ, especially where there is a heavy load of administrative and logistical traffic, wire is employed to great advantage. Telephone and teletype systems contribute to the rapid interchange of information. Wire communications can and should be used in any situation where time and security permit its installation. In comparison with organic radio communications nets which are immediately available, wire nets may require more time to establish. They also are less flexible, and are susceptible to disruption by enemy fire, traffic, and sabotage. However, wire nets are generally more secure and more reliable than radio nets and have the distinct advantage of not being adversely affected by variations in weather and terrain. Some of the wire equipment found in engineer units is listed in table E-2.

E-5. Messenger

Messengers may be used extensively in local engineer operations for the delivery of low-precedence messages that would otherwise overload electrical facilities. They may also be used when wire and radio communications are impracticable, when communications equipment breaks down, and for the delivery of bulky material. Messengers are the most secure means of communications.

E-6. Visual

Visual communications of various types are often employed in the course of engineer support operations. Visual messages can be communicated by flag or arm signals; lamps and flashlights; panels, pyrotechnics and smoke signals; and infrared signaling devices.

E-7. Sound

This classification includes communications by gong, siren, horn, whistle, klaxon, buzzer, and similar devices. Sound signals are normally employed to transmit prearranged messages or warnings, such as a gas or air-raid warnings.

E-8. Displacement

a. Command Posts. The tactical situation occasionally may require the establishment of an alternate or an additional command post. Engineer units normally have only essential communications-electronics equipment; therefore, organic equipment must be used to the utmost. Normally the radios of the executive officer or the S3 are used when fragmentation is required. The unit communications officer must fully utilize communications equipment and realize that each tactical situation will present a different communications situation which will call for various combinations of communications equipment.

b. Jump Communications. The capability to move forward and displace an engineer unit and still provide communications at both locations is called a jump. The communications officer normally will provide a jump team to move forward with the advance unit to provide communications. When the rear area unit moves forward, it becomes the jump team and assumes the role of the advance communications team. No additional communications equipment is provided for this jump team and organic equipment must be used for this move.

c. Radio-Relay. In some situations, where distance or terrain features prohibit station-to-station contact, radio may be located on high ground to act as a radio relay station.

d. Radio Wire Integration. Radio wire integration (RWI) can be used to connect the commander and staff or other radio stations of the engineer units to the unit switchboard and its subscribers. The system is established so that continuous communications can be maintained within and between all units.

Table E-1. Radio Equipment

Type	Planning distance	Frequency range	Type of service	Remarks
AN/GRC-106	80 km	2-29.999 MHz	SSB-Voice AM-Voice AM-CW	Command net.
AN/PRC-77	5-8 km	30-75.95 MHz	FM	Portable transistorized set. Used at squad level or for utility set for dismounted operations. Single receiver transmitter. Used at company and platoon level when working in one net only. Also used by battalion and higher staff.
AN/VRC-46	25-32 km	30-75.95 MHz	FM	
AN/VRC-47	25-32 km	30-75.95 MHz	FM	Single transmitter with two receivers. Used at company and higher level to monitor one net while working in another.
AN/VRC-49	25-32	30-75.95 MHz	FM	Two AN/VRC-46 mounted together w/retransmission capability.
AN/GRC-46	80 km	1.5-20 MHz Transmit 0.5-32 MHz Reception	AM-Voice AM-RATT AM-CW	Used throughout the combat zone. Will be replaced by the AN/GRC-122 or AN/GRC-142.
AN/GRC-122	80 km	2-29.999 MHz	SSB-Voice AM-CW AM-Voice SSB-RATT	Replaces AN/GRC-46. Used throughout the combat zone for command, operations, and intelligence nets. Has full duplex RATT capability.
AN/VRC-64	5-8 km	30-75.95 MHz	FM	Vehicular version of radio set AN/PRC-25. Used in units when short range vehicle radio is required.
AN/GRC-160	5-8 km	30-75.95 MHz	FM	Combination vehicular-man pack version of radio set AN/PRC-25. Employed in company and battalion.
AN/GRC-142	80 km	2-29.999 MHz	SSB-Voice AM-CW AM-Voice SSB-RATT	Replaces AN/GRC-46 used throughout combat zone for command operation and intelligence nets. Has half duplex RATT capability.

Other Radio Equipment

Also authorized by TOE is a variety of supplemental antennas, D. C. generators, radio set control groups, (remote and radio wire integration operations) power supplies, and repair and testing equipment.

Legend
SSB—Single Sideband
CW—Continuous Wave
RATT—Radio Teletypewriter
FM—Frequency Modulated
AM—Amplitude Modulated
MHz—Megahertz

Table E-2. Wire Equipment

Type	Description
Switchboards	
SB-22/PT.....	A portable, local battery monocord switchboard, capable of connecting 12 local battery telephone circuits, remote controlled radio circuits, or voice frequency teletypewriter circuits.
SB-993/GT.....	A lightweight, portable, emergency switchboard, capable of handling six local battery telephone lines. Normally employed in company size units. Must have a separate telephone instrument provided for the switchboard operator.
SB-86/P.....	A complete, transportable, single position nonmultiple, local battery, tactical switching central capable of terminating 30 magneto or common battery signaling lines or trunks. Employed throughout the combat zone.
Telephones	
TA-1/PT.....	A sound powered telephone for use on field wire lines to communicate with any field telephone, local battery switchboard, or common battery switchboard. Employed in forward combat areas at company level.
TA-312/PT.....	A rugged, lightweight, waterproof, battery operated telephone set designed for local battery, common battery, or common battery signaling operation. Employed throughout the combat zone.
Teletypewriter	
AN/GGC-3.....	A lightweight, transportable teletypewriter set. Provides facilities for manual transmission directly from keyboard, and tape transmission from transmitter-distributor. Received messages are printed and perforated on a paper tape for later transmission. Employed throughout the combat zone.
AN/PGC-1.....	A portable send-receive teletypewriter page printer. Employed throughout the combat zone.
Wire	
WD-1/TT.....	General purpose, twisted pair, polyethylene field telephone wire packaged as follows: ¼ mile on spool, DR-8; ½ mile on wire dispenser, MX-306A/G; one mile on wire reel, RL-159/U; and 2½ miles on cable reel, DR-5.
Other Wire Equipment	
Also authorized by TOE is a variety of wire dispensing reels, repair and installation sets, and testing equipment.	

c. The capabilities of a type B organization are the same as those of a level 1 organization.

(1) The type B column adapts this TOE to the lesser requirements for United States military personnel. Vacancies in the type B column indicate the types of positions which can be filled by non-United States personnel. The number of non-United States personnel must be determined by the major commander to whom the unit is assigned and will depend upon the capacity of available personnel to produce, the number of shifts, and other local conditions.

(2) Interpreters and translators required when organized under the type B column will be provided from appropriate teams available to the theater commander.

(3) Authorization of United States military personnel shown in the type B column may be modified by troop basis proponents as required by local area conditions of employment to enable that unit to effectively accomplish its mission when authorized by DA.

d. The columns designated by levels 1 through 3 are designed to relate to the categories established by AR 220-1 and AR 135-8.

e. When supported by attachments of specialized personnel and equipment the battalion provides:

(1) Large-scale bituminous paving operations (engineer construction support company, TOE 5-114).

(2) Large-scale portland cement concrete paving operations (engineer concrete mixing and paving teams, TOE 5-520).

(3) Large-scale quarrying and crushing operations (engineer construction support company, TOE 5-114, and quarrying and processing team, TOE 5-520).

(4) Major reconstruction of railroads and railroad bridges (engineer construction support company, TOE 5-114).

(5) Major rehabilitation of ports (engineer company, port construction, TOE 5-127, and dredge teams, TOE 5-550).

(6) Major protective construction (engineer construction support company, TOE 5-114).

(7) Construction of pipelines (engineer pipeline construction support company, TOE 5-177).

(8) When required, teams from cellular TOE may be authorized by MTOE.

f. Augmentation paragraphs provide personnel required for second-shift equipment operation.

g. Individuals of this organization, except the Chaplain and medical personnel, can engage in effective, coordinated defense of the unit's area or installation.

h. The unit provides direct support maintenance of engineer and power generation equipment for the battalion, and organizational maintenance of organic equipment.

i. This unit depends on a personnel service company, TOE 12-67, for direct support personnel services, and a finance service organization, TOE 14-500, for finance services.

F-4. Organization

a. A headquarters and headquarters company provides the battalion headquarters with personnel and equipment for the staff sections.

b. An engineer equipment and maintenance company provides equipment with operators to reinforce the construction companies and provides DS maintenance of engineer equipment and power generation equipment. The company also provides battalion maintenance of engineer equipment and recovery assistance.

c. Three engineer construction companies are the operating elements of the battalion. These companies have balanced capabilities for construction and may operate at remote locations to accomplish company-size and small projects.

d. See figure F-1 for an organization chart.

F-5. Duties and Functions

See individual units organic to the battalion for a delineation of duties and functions.

F-6. Basis of Allocation

Two to four per engineer construction group.

F-7. Category

This unit is designated a category II unit (AR 310-25).

F-8. Mobility

a. Eighty percent, using organic vehicles.

b. One hundred percent mobile in USAF aircraft, except for 21 wheeled tractors and 12 towed scrapers.

F-9. Employment

a. The engineer construction battalion may be employed independently as a unit; may operate separately, assigned to the commander of the major force supported; or may operate as an integral element of the engineer construction group. While the battalion is designed to function as a unit under the command of the battalion commander; its organic construction companies may be temporarily detached for specific missions.

b. The battalion may be used in an area assignment where it is responsible for all construction activities within the area, or in a task assignment, or in a combination of both. When required, it may also operate in the field army area on a mission-type assignment.

c. When properly supported by attachments of specialized units or detachments from the construction group, the battalion can perform specialized heavy construction. It can do this when operating as a unit or with the construction companies operating independently.

d. The battalion has a limited planning and design capability. It depends upon the group for any specialized planning and design, and must be augmented by the attachment of specialized personnel when these capabilities are required.

F-10. Relationship of Higher, Subordinate, and Adjacent Units

a. Higher headquarters is the HHC, engineer construction group. The CO, engineer construction group issues orders and directives to the battalion.

b. Subordinate units are the organic units of the battalion. Additional units and teams may be attached to the battalion when required.

c. Adjacent units within the engineer construction group provide support to the battalion as directed by the CO, engineer construction group.

F-11. Major Item of Equipment

See discussions of subordinate units of the engineer construction battalion.

F-12. Communications

See discussions of subordinate units of the engineer construction battalion.

F-13. Summary of Changes

a. Mission.

(1) 5-115G. . . . COMM/ and rear areas of combat zone. . . .

(2) 5-115H. . . . theater of operations. . . .

b. Assignment No change.

c. Capabilities Rearranged to comply with CDC policy.

d. Basis of Allocation No change.

e. Category II No change.

f. Mobility Seven percent reduction.

g. Personnel.	5-115G	5-115H
(1) Officer -----	31	31
(2) Warrant officer -----	6	6
(3) Enlisted men -----	891	828
(4) Aggregate -----	928	865
(5) Augmentation -----	None	96
(6) Total -----	928	961

h. Organizational.

(1) HHC-5-115H

Utilities section deleted.

S4 Change branch from NO to EN.

Maintenance section added (staff section).

Second shift operators to augmentation.

(2) Equipment maintenance company 5-117H. No change.

(3) Engineer construction company 5-118H (Functionalized at platoon level).

Earthmoving platoon. Change title to horizontal construction platoon.

2 general construction platoons deleted.

Vertical construction platoon added.

Special skills platoon added.

i. Equipment.

See TOE 5-116, 5-117, 5-118 for changes in equipment authorization.

Section II. HEADQUARTERS AND HEADQUARTERS COMPANY, ENGINEER CONSTRUCTION BATTALION, TOE 5-116H

F-14. Mission

To provide command, construction planning, direction, coordination and control of the engineer construction battalion and attached units. Missions and construction directives are received from higher headquarters. The unit staff prepares orders and directives for subordinate and attached units, and provides supervision and support of these units.

F-15. Assignment

Organic to the engineer construction battalion, TOE 5-115.

F-16. Capabilities

a. At level 1 this unit provides—

(1) Technical advice and direction and supervision of organic and attached units for construction projects.

(2) Supervision of contract labor and indigenous personnel.

(3) Design and detailed plans, construction layouts, site adaptations, and bills of materials.

(4) Ground reconnaissance, and preliminary and final surveys for battalion projects.

(5) Guidance in determining the personnel and equipment requirements of the companies and effecting temporary interchanges when required.

(6) Administration, supply, and medical services to units in the battalion.

(7) Engineer intelligence for the battalion.

(8) Two water purification teams for purification of water for the battalion and for other units when required.

(9) Battalion communications with subordinate units.

(10) Administration, supply, and mess for the company.

b. The columns under levels 2 and 3 adapt this table for reduced operational capabilities in decrements of 10 percent to approximately 90 percent for level 2 and 80 percent for level 3.

c. The capabilities of a type B organization are the same as those of a level 1 organization.

(1) The type B column adapts this TOE to the lesser requirements for United States military personnel. Vacancies in the type B column indicate the types of positions which can be filled by non-United States personnel. The number of such personnel must be determined by the major commander to which the unit is assigned and will depend on the capability of available personnel, the number of shifts, and other local conditions.

(2) Interpreters and translators required when organized under the type B column will be provided from appropriate teams available to the theater commander.

(3) Authorization of United States military personnel shown in the type B column may be modified by troop basis proponents as required by local area conditions of employment in order to enable the unit to effectively accomplish its mission WAB DA.

d. The columns designated by levels 1 through 3 are designed to relate to the categories established by AR 220-1, Unit Readiness and AR 135-8, Reserve Component Unit Readiness.

e. The capabilities of this unit are increased by adding teams from cellular TOE which, when required, would be authorized by MTOE.

f. The capabilities of this unit are increased by the addition of augmentation personnel and equipment.

g. Individuals of this organization, except the Chaplain and medical personnel, can engage in effective, coordinated defense of the unit's area or installation.

h. Organizational maintenance of organic equipment, and also provides organizational maintenance of communications equipment for other units in the battalion.

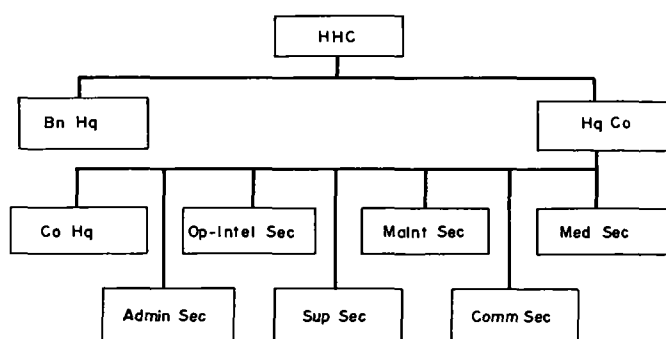


Figure F-2. Organizational chart, headquarters and headquarters company, engineer construction battalion.

i. This unit depends on the personnel service company, TOE 12-67, for direct support services and on finance service organization, TOE 14-500, for finance services.

F-17. Organization

See figure F-2 for the organization of HHC, engineer construction battalion, TOE 5-116H.

F-18. Duties and Functions

The HHC consists of the battalion headquarters and headquarters company.

a. Battalion headquarters consists of the battalion commander and his staff.

b. Headquarters company provides personnel and equipment for the battalion headquarters. The organizational changes in this unit are the deletion of the utilities section and the addition of a maintenance section. The functions performed by the utilities section are now performed by the supply section and the construction company.

(1) Company headquarters provides unit administration, supply, organizational maintenance, and mess for the company.

(2) Administrative section provides battalion level administration and coordinates unit support by area support units.

(3) Operations and intelligence section provides intelligence, plans, orders, construction supervision, and construction services for the battalion. The construction services include construction surveying; terrain and soils analysis; reconnaissance; materials testing of concrete, asphalt, and soils; and photography.

(4) Supply section provides organizational supply, construction supply, potable water for the battalion and for other units when required, and nonpotable water for construction operations.

(5) Maintenance section provides staff supervision of equipment utilization and maintenance for the battalion.

(6) Communications section provides an operating station in the radio net of higher headquarters, battalion radio and wire communications, and organizational maintenance of communications equipment for the battalion.

(7) Medical section provides a battalion aid station. It provides company aidmen on the basis of one company aidman per company, and operates an ambulance.

F-19. Basis of Allocation

One per engineer construction battalion, TOE 5-115H.

F-20. Category

This unit is designated a category II unit (AR 310-25).

F-21. Mobility

a. One hundred percent mobile using organic transportation.

b. One hundred percent air transportable in medium transport aircraft.

F-22. Employment

Headquarters and headquarters company is employed in consonance with battalion operations to support construction efforts of either battalion- or company-size elements. Its mission is the same in either case.

F-23. Relationship of Higher, Subordinate, and Adjacent Units

a. The higher headquarters is normally the HHC, engineer construction group, TOE 5-112.

b. Subordinate units are the organic companies of the battalion. Additional teams and units of the engineer construction group, when attached to the engineer construction battalion, become subordinate units.

F-24. Major Items of Equipment

Major items of equipment organic to HHC include the following: water purification equipment sets; organizational and DS shop equipment maintenance sets; test sets (soils and concrete), and equipment required to support staff and HHC operations.

F-25. Communications

Figure F-3 indicates the wire/telephone communications network common to HHC, engineer construction battalion. Figure F-4 depicts the radio diagram.

F-26. Summary of Changes

a. *Mission.* No change.

b. *Assignment.* No change.

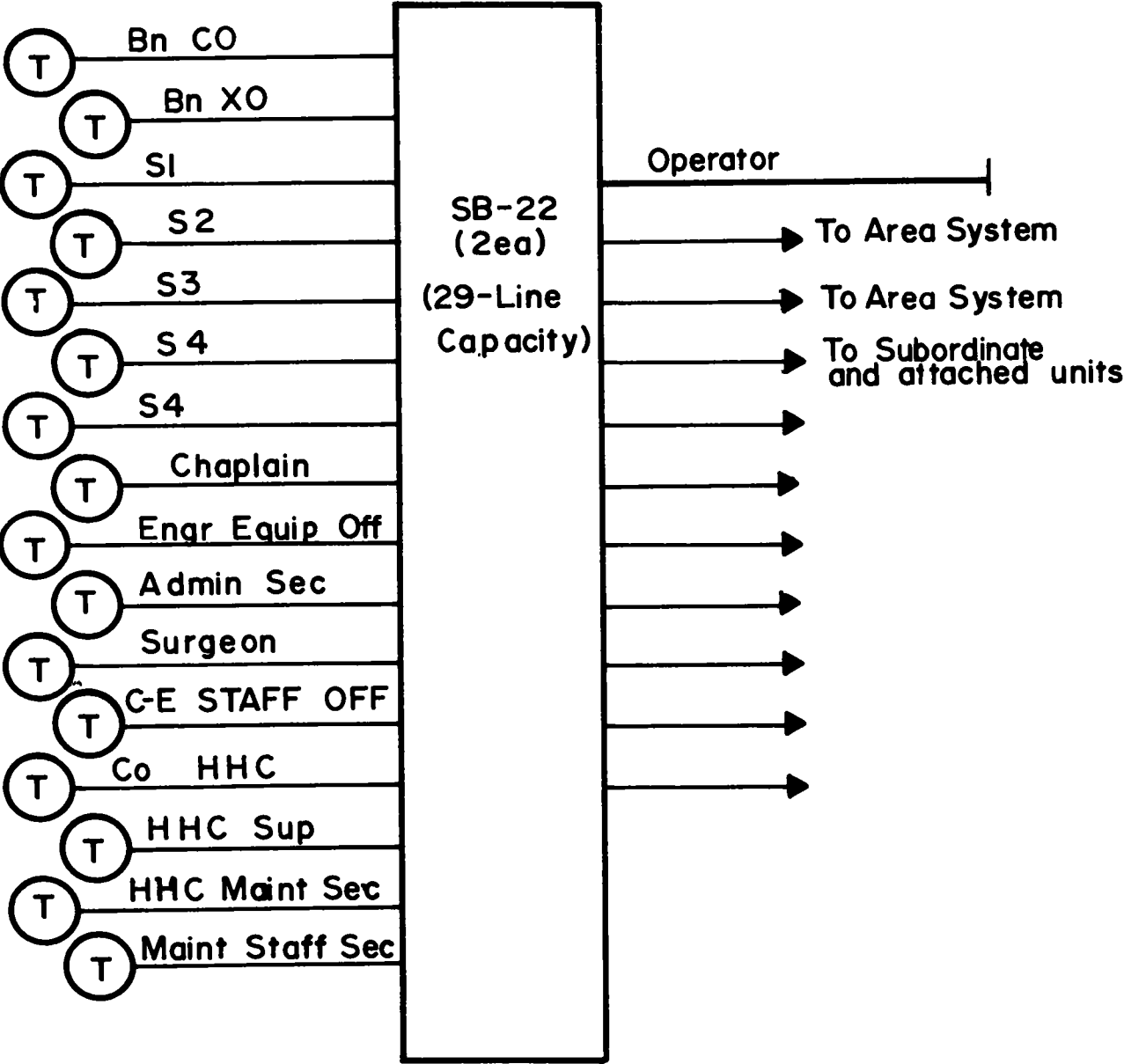
c. *Capabilities.*

- (1) Delete utilities section.
- (2) Add maintenance section.
- d. *Basis of Allocation.* No change.
- e. *Category.* No change.
- f. *Mobility.* Increase of 11 percent.
- g. *Personnel.*

(1) Basic TOE	----	13	2	98	113
(2) Augmentation	-	--	--	10	10
(3) Total	-----	13	2	108	123
(4) TOE 5-116G	--	13	1	107	121

- h. *Organizational:*
 - (1) Add maintenance section, MACRIT.
 - (2) Delete utilities section.
 - (3) Net decrease of eight personnel in basic TOE.
 - (4) Net increase of two personnel including augmentation.

i. <i>Equipment:</i>			
(1) Aircraft	-----	None	None
(2) Missiles	-----	None	None
(3) Crew weapons and combat vehicles, MG 7.62mm	----	4	4



(T) - Field Telephone, TA-312

Figure F-3. Wire diagram, HHC engineer construction battalion, TOE 5-116H.

(4) *Tactical vehicles.*

Truck Amb $\frac{3}{4}$ T	1	1
Truck Cgo $\frac{3}{4}$ T	9	9
Truck Cgo $2\frac{1}{2}$ T	7	7
Truck Cgo 5T	1	1
Truck Util $\frac{1}{4}$ T	10	10

(5) *Communications.*

Pomer Supply PP-2953/U	2	1
Public Address P10-5	2	2
Radio Set GRC-106	0	2
VRC-46	5	2
VRC-47	0	3
VRC-49	1	1
Control Group GRA-39	1	1
Switchboard SB-22	2	2
Telephone TA-312/PT	16	16

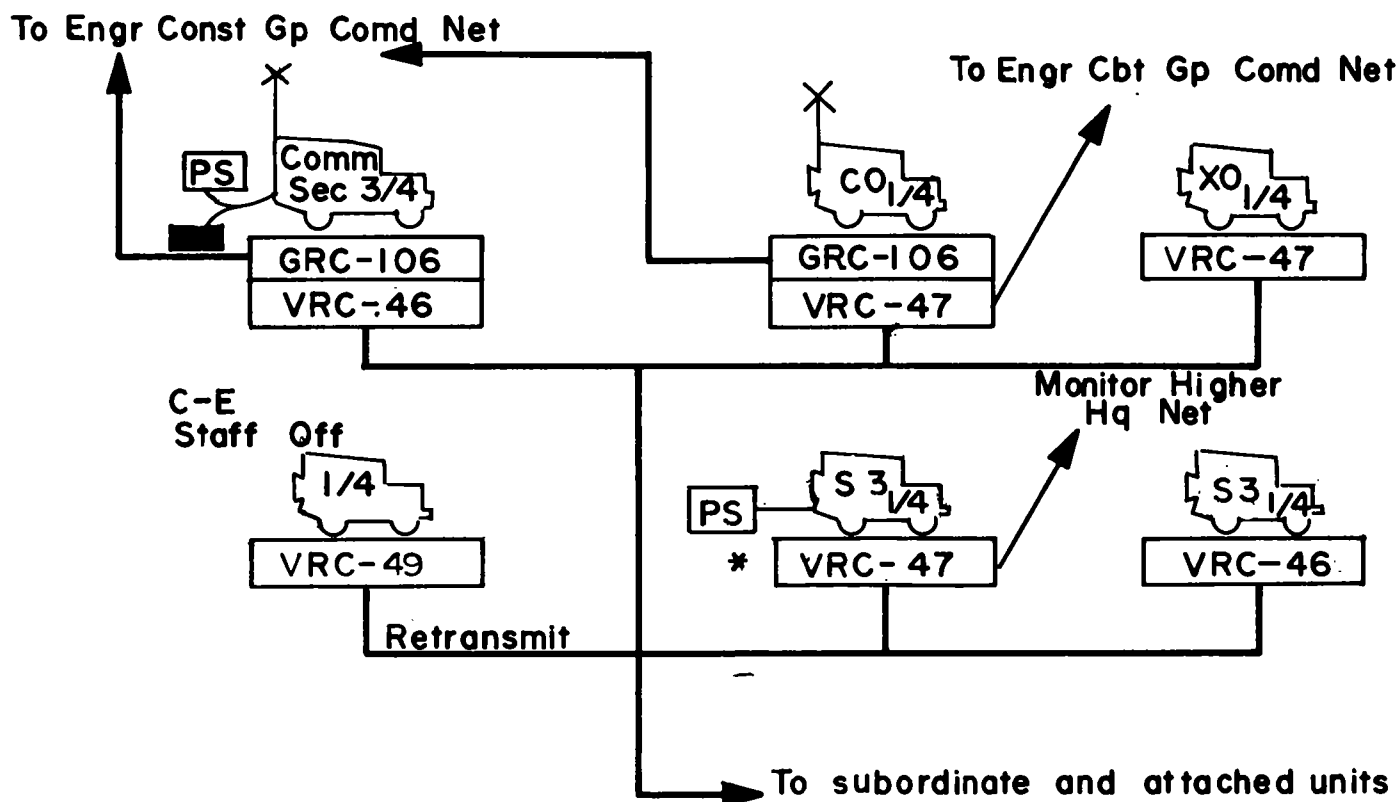
(6) *Other support equipment.*

Compressor 5 CFM	1	1
Detecting Set Nonmetallic	1	1
Detecting Set Metallic	2	2
Gen Set 1.5 KW AC	3	3
Gen Set 3 KW DC	0	3
Gen Set 10 KW	4	4

Heater Duct 250 K BTU	0	1
Ion Exchange, Trk Mtd	1	1
Pump Centrfr GED		
125 GPM	2	2
Reproduction Set DIAZO	1	1
Spray Outfit 2-Gun	1	1
Tank & Pump Unit	1	1
Trailer Cgo $\frac{1}{4}$ T	10	2
Trailer Cgo $\frac{3}{4}$ T	7	6
Trailer Cgo $1\frac{1}{2}$ T	6	6
Trailer Tk Water	1	1
Water Purif Equip		
1500 GPH, Trk Mtd	2	2

(7) *Other construction equipment.*

Book Set Cbt Gp	1	1
Book Set Const Gp	1	1
Driver Projectile	2	2
Scale Ream 300 Lb	1	1
Survey Set	2	2
Test Set Asphalt	1	1
Test Set Concrete	1	1
Test Set Soil	1	1
Tool Kit Carp Engr Sqd	1	1



* Note—May also be used to establish project net

Figure F-4. Radio Diagram, HHC engineer construction battalion, TOE 5-116H.

Section III. ENGINEER EQUIPMENT AND MAINTENANCE COMPANY

ENGINEER CONSTRUCTION BATTALION, DPTOE 5-117H

F-27. Mission

To support the engineer construction battalion by providing construction equipment with operators and engineer direct support maintenance. The mission statement is changed to agree with the unit title and normal mission priority. The company provides equipment with operators to supplement or to reinforce the other companies of the battalion and provides maintenance support for the battalion.

F-28. Assignment

Organic to the engineer construction battalion, TOE 5-115.

F-29. Capabilities

a. At level 1, this unit provides:

(1) Engineer construction equipment with operators to reinforce the construction companies.

(2) Equipment and specialist personnel to support the construction companies in bituminous operations.

(a) Dust palliation.

(b) Surface treatment.

(c) Penetration macadam paving.

(d) Road mix paving.

(e) Low type portable plant mix asphaltic concrete of three tons per hour.

(3) Aggregate production of up to 75 tons per hour.

(4) Dump truck support to the organic crushing and asphalt equipment.

(5) Direct support maintenance for engineer construction and power generator equipment organic to the engineer construction battalion to include contact maintenance teams for jobsite repair.

(6) Machine shop facilities.

(7) Repair parts required to support the battalion maintenance mission.

(8) The capability to supervise contract labor and indigenous personnel and to assist in the supervision of contract construction.

(9) Coordination for direct support maintenance for other than engineer construction and power generation equipment and all general support maintenance from a maintenance support company (communications zone), TOE 29-247.

b. The columns under levels 2 and 3 adapt this table for reduced operational capabilities in decrements of 10 percent to approximately 90 percent at level 2 and 80 percent at level 3.

(1) At level 2 the quantity of light vehicle drivers and crane operators is reduced.

(2) At level 3 the quantity of equipment operators and dump truck drivers is reduced.

c. The capabilities of a type B organization are the same as those of a level 1 organization.

(1) The type B column adapts this TOE to the lesser requirements for United States military personnel. Vacancies in the type B column indicate the types of positions which can be filled by non-United States personnel. The number of such personnel must be determined by the major commander to whom the unit is assigned and will depend on the capacity of available personnel, the number of shifts, and other local conditions.

(2) Interpreters and translators required when organized under the type B column will be provided from appropriate teams available to the theater commander.

(3) Authorization of United States military personnel shown in the type B column may be modified by troop basis proponents as required by local area conditions of employment in order to enable the unit to effectively accomplish its mission when authorized by DA.

d. The columns designated by levels 1 through 3 are designed to relate to the categories established by AR 220-1 and AR 135-8, Unit Readiness.

e. The capabilities of this unit may be increased by adding engineer equipment operating teams from cellular TOE which, when required, may be authorized by MTOE.

f. The capabilities of this unit to provide 2-shift operation are provided by adding personnel shown in augmentation paragraphs.

g. Individuals of this organization can engage in effective, coordinated defense of the unit's area or installation.

h. This unit provides battalion level maintenance of engineer equipment for the battalion, and organizational maintenance of organic equipment, except communications equipment.

i. This unit depends on:

(1) HHC, engineer construction battalion, TOE 5-116, for organizational maintenance of communications equipment.

(2) Personnel service company, TOE 12-67, for direct support personnel services.

(3) Finance service organization, TOE 14-500, for finance services.

F-30. Organization

See figure F-5 for the organization of the engineer equipment and maintenance company, engineer construction battalion, TOE 5-117H.

F-31. Duties and Functions

a. Company Headquarters. Company headquarters is divided into—

(1) Headquarters section, which provides the command, administration, mess, and supply for the company.

(2) Company maintenance section, which provides organizational maintenance on automotive materiel and construction equipment for the company.

b. Equipment Platoon. The equipment platoon consists of—

(1) Platoon headquarters, which provides command and control of the platoon sections.

(2) Engineer direct support maintenance section, which furnishes engineer equipment repairmen to perform direct support maintenance on all engineer equipment and power generators of the battalion and contact maintenance teams for job-site repair of engineer equipment.

(3) Battalion maintenance section, which furnishes personnel and equipment to provide the battalion with a full organizational maintenance capability by providing backup organizational maintenance support of engineer equipment to the organic companies, and recovery of vehicles and equipment.

(4) Supply section, which provides personnel and equipment for requisitioning and maintaining stock levels, and storing and issuing mission load repair parts for engineer equipment of the battalion. Mission load repair parts include repair parts for the direct support maintenance (authorized stockage list (ASL)) of the maintenance platoon

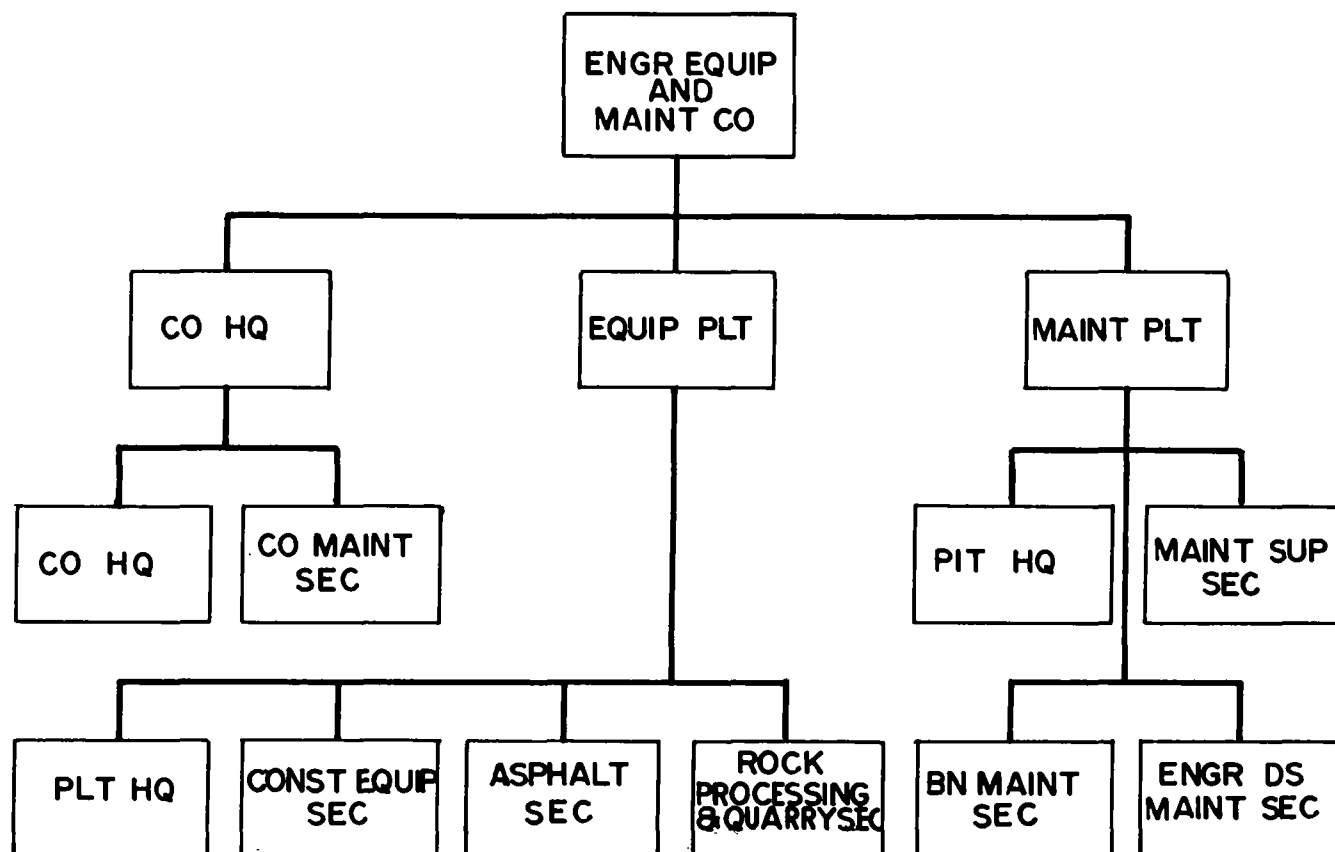


Figure F-5. Organizational chart, equipment and maintenance company, engineer construction battalion.

and repair parts for organizational maintenance (prescribed load list (PLL)) for the battalion.

F-32. Basis of Allocation

One per engineer construction battalion, TOE 5-115.

F-33. Category

This unit is designated a category II unit (AR 310-25).

F-34. Mobility

- a. Fifty percent mobile using organic vehicles.
- b. One hundred percent air transportable in USAF aircraft.

F-35. Employment

The engineer equipment and maintenance company is employed in support of the organic construction companies of the construction battalion. It provides additional capabilities for those units by supplying specialized personnel and equipment, performing direct support maintenance for the battalion's organic engineer vehicles and equipment, and backup organizational maintenance for the entire battalion.

F-36. Relationship of Higher Subordinate, and Adjacent Units

a. Higher headquarters is HHC, engineer construction battalion, TOE 5-116. The company is dependent upon higher headquarters for orders, construction directives, plans and staff supervision.

b. The company normally operates as an entity in general support of the battalion. Cellular teams may be attached to the company and would become subordinate units.

c. Adjacent units in the battalion receive support from the company in accordance with plans, orders, and directives published by the CO, engineer construction battalion.

F-37. Major Items of Equipment

Major items of equipment organic to the equipment and maintenance company include: crane-shovels with attachments for pile driving, excavating, moving earth and aggregate, and lifting loads; ditching machines; compaction equipment; bituminous distributors; drier-mixer bituminous

concrete material; aggregate spreaders; 60 ton capacity aggregate storage bin; 75-ton-per-hour crushing and screening plant; rock drilling equipment; tractors; shop equipment sets; and a steam cleaning set.

F-38. Communications

See figures F-6 and F-7 for the wire and radio diagrams of the equipment and maintenance company.

F-39. Summary of Changes

- a. *Mission.* No change.
- b. *Assignment.* No change.
- c. *Capabilities.* No change.
- d. *Basis of Allocation.* No change.
- e. *Category.* No change.
- f. *Mobility.* A 34 percent reduction in mobility due to vehicle/trailer reductions.

g. Personnel:

	OFF	WO	EM	AGGR
(1) Basic TOE ----	3	1	160	164
(2) Augmentation _			23	23
(3) Total -----	3	1	183	187
(4) TOE 5-117G --	3	2	175	180

h. Organization:

- (1) Add Mechanics; MACRIT.
- (2) Delete second-shift operators.
- (3) Net decrease of 16 personnel in basic TOE.
- (4) Net increase of 7 personnel including augmentation.

i. Equipment:

	5-117G	5-117H
(1) <i>Aircraft</i> -----	None	None
(2) <i>Missiles</i> -----	None	None
(3) <i>Crew weapons and combat vehicles:</i>		
MG 7.62mm -----	6	6
(4) <i>Tactical vehicles:</i>		
Truck Cgo ¾T -----	5	5
Truck Cgo 2½T -----	9	10
Truck Cgo 5T -----	2	2
Truck Dp 5T -----	12	9
Truck Tractor 5T -----	3	3
Truck Tractor 10T -----	8	3
Truck Util ¼T -----	3	3
Truck Wrecker 5T -----	2	2
Truck Dump 22T -----	0	3

5-117G 5-117H

(5) *Communication equipment:*

Radio Set, VRC-47 -----	1	1
Switchboard SB-22 -----	1	1
Telephone Set TA-312/PT	10	10

(6) *Other support equipment:*

Auger Skd Mtd -----	1	1
Bin Storage Aggr -----	1	1
Chassis Trlr 3½T -----	2	2
Cleaner Steam -----	1	1
Compressor 15 CFM -----	1	1
Compressor 5 CFM -----	1	1
Compressor 600 CFM		
Whl Mtd -----	1	1

5-117G 5-117H

Crane-Crawler 12½T -----	2	2
Crane, Trk Mtd, 20T -----	0	3
Crush-Screen Plant 75		
TPH -----	1	1
Detecting Set Nonmetallic	1	1
Detecting Set Metallic ---	1	1
Distributor Bit 800G		
Trk Mtd -----	2	2
Ditching Machine Whl Mtd	2	2
Drier Mixer 3 TPH -----	1	1
Gen Set 15 KW -----	1	1
Gen Set 100 KW -----	2	2
Gen Set 1.5KW AC -----	1	1

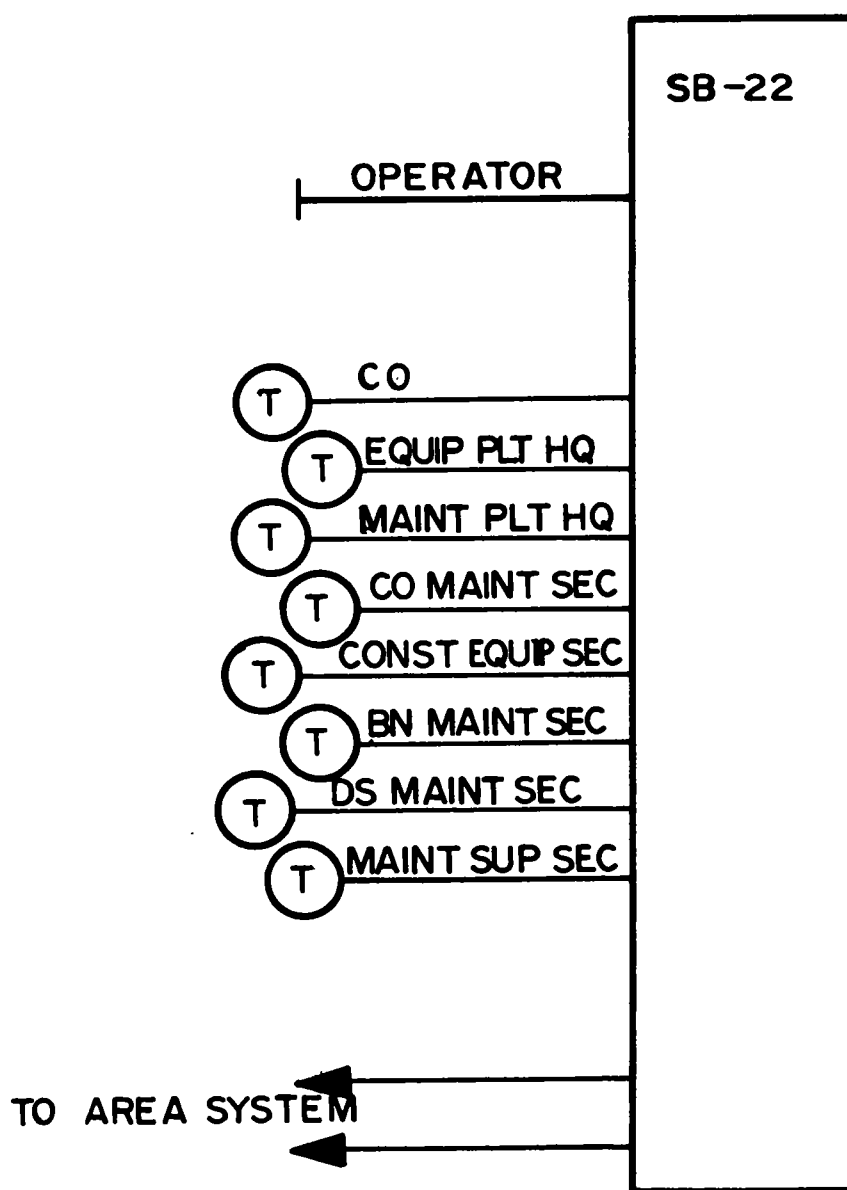


Figure F-6. Wire diagram, engineer equipment and maintenance company, engineer construction battalion TOE 5-117H.

	5-117G	5-117H
Gen Set 3 KW AC -----	2	2
Gen Set 3 KW DC -----	2	3
Gen Set 5 KW AC -----	3	3
Gen Set 10 KW -----	0	1
Hammer Pile SP -----	1	1
Heater Duct 250 K BTU--	6	5
Heater Hot Oil -----	1	1
Kettle, Trlr Mtd, 165G ---	1	1
Loader, 2½ CY -----	3	3
Lubricating Unit Trlr Mtd	4	4
Melter Asphalt -----	1	2
Mixer, Rotary Tiller, SP -	1	1
Mounter-Demounter Tire -	1	1
Pneumatic Tool Outfit		
Trlr Mtd -----	1	1
Pumping Assembly Liquid		
Fuel -----	1	1
Rock Drill Equipment ----	1	1
Roller Mtz 5-8T -----	1	1
Roller, Towed 7½-50T --	2	2
Semitrailer Low Bed 25T--	6	3
Semitrailer 12T -----	1	1
Semitrailer Van 6T -----	3	3
Shop Equip Con Maint		
Trk Mtd -----	3	3
Shop Equip Elec Semitrailer		
Mtd -----	0	1
Shop Equip Gp, Semitrailer		
Mtd -----	1	1
Shop Equip Org Lt		
Trk Mtd -----	1	1

	5-117G	5-117H
Spreader Aggr Towed ---	4	4
Sweeper GED Towed ----	1	1
Tank & Pump Unit -----	2	2
Tractor FT Mdm Winch--	2	2
Trailer Cgo ¼T -----	3	0
Trailer Cgo ¾T -----	6	1
Trailer Cgo 1½T -----	6	7
Trailer Flat 10T -----	1	4
Trailer Tank Water -----	1	1
Truck-Lift Fork 6K RT --	1	1
Truck-Lift Fork 10K RT--	1	1
Welding Shop Trlr Mtd --	3	3

(7) Other construction equipment:

Adapter Piledriver Lead -	1	4
Backhoe ¾CY -----	1	1
Ball Wrecking 3T -----	1	1
Blasting Machine 50 Cap--	1	1
Book Set Cbt Gp -----	1	1
Boom Ext 10 FT -----	2	5
Boom Jib 15 FT -----	1	4
Bucket Clam ¾ CY -----	2	5
Bucket Drag ¾ CY -----	1	4
Cap Wood Pile -----	0	3
Catwalk Piledriver -----	1	4
Demolition Set -----	2	2
Fairlead -----	1	4
Floodlight Set -----	2	2
Hammer PD Drop 3,000 LB	0	3
Lead Section Lower -----	2	8
Lead Section Top -----	1	4
Shovel Front ¾ CY -----	2	2
Tagline -----	2	5

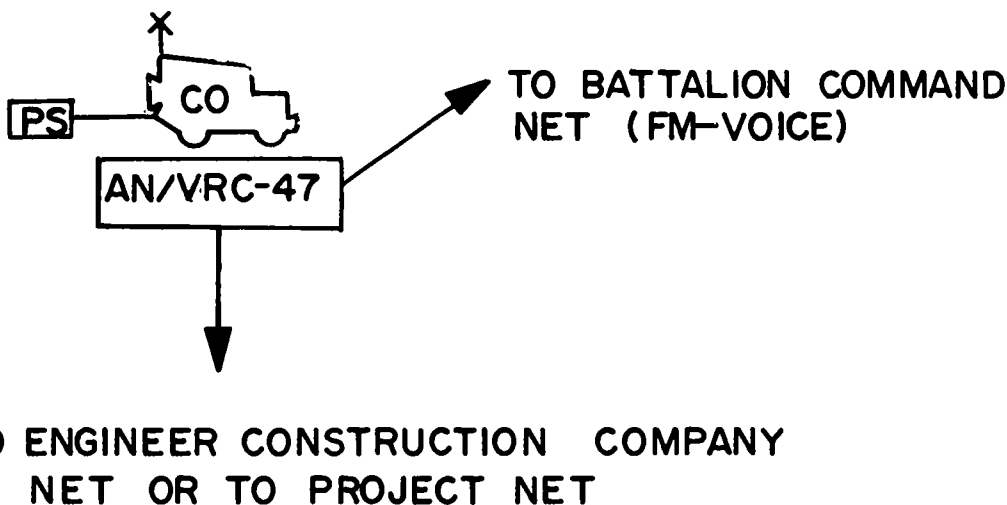


Figure F-7. Radio diagram, engineer equipment and maintenance company, engineer construction battalion
TOE 5-117H.

Section IV. ENGINEER CONSTRUCTION COMPANY, ENGINEER CONSTRUCTION BATTALION, DPTOE 5-118H

F-40. Mission

a. To excavate, haul, compact and grade earth, and to provide stabilized earth subgrades for airfields, roads, railroads, levees, supply storage areas, and similar projects.

b. To construct and rehabilitate buildings, port facilities, bridges and drainage structures; pipelines and storage tanks plus related facilities; and to install and repair utilities.

c. The engineer construction company receives orders, construction directives, planning guidance, designs, and construction support from HHC, engineer construction battalion. Additional specialized skills and equipment are provided by construction support units supporting the construction battalion.

F-41. Assignment

The engineer construction company is organic to the engineer construction battalion, TOE 5-115H.

F-42. Capabilities

a. At level 1, this unit—

(1) Operates borrow pits and hauls borrow pit materials; performs cut and fill, compacts natural or fill material to provide subgrades of specified bearing strength; and levels natural or fill materials to desired grades.

(2) Constructs or rehabilitates theater-of-operation buildings, shelters, pipeline systems, and operational facilities; and erects prefabricated structures.

(3) Installs electrical, water, and sewage facilities for theater-of-operation installations.

(4) Performs heavy general construction, when supported with additional construction personnel and heavy equipment.

(5) Provides construction effort for bomb-damage recovery operations.

(6) Has the capability to supervise contract labor and indigenous personnel and to assist in the supervision of contract construction.

b. The columns under levels 2 and 3 adapt this table for reduced operational capabilities, in degressive 10 percent increments to approximately 90 percent for level 2, and 80 percent for level 3.

(1) At level 2 skilled labor construction capabilities are reduced approximately 10 percent

while equipment construction capabilities remain 100 percent.

(2) At level 3 skilled labor construction capabilities are reduced approximately 20 percent, while equipment construction capabilities remain 100 percent.

c. The capabilities of a type B organization are the same as those of a level 1 organization.

(1) The type B column adapts this TOE to the lesser requirements for United States military personnel. Vacancies in the type B column indicate the type of positions which can be filled by non-United States personnel. The number of such personnel must be determined by the major commander to whom the unit is assigned and will depend on the capacity of available personnel, the number of shifts, and other local conditions.

(2) Interpreters and translators required when organized under the type B column will be provided from appropriate teams available to the theater commander.

(3) Authorization of United States military personnel shown in the type B column may be modified by troop basis proponents to enable the unit to accomplish its mission when authorized by DA.

d. The columns designated by levels 1 through 3 are designed to relate to the categories established by AR 220-1 and AR 135-8, Unit Readiness.

e. Additional engineer capabilities may be provided by adding engineer teams from cellular TOE of the 5-500-series when authorized by MTOE.

f. Augmentation provides personnel to operate equipment for second shift operations.

g. Individuals of this organization can engage in effective, coordinated defense of the unit's area or installation.

h. This unit performs organizational maintenance of organic equipment except radios.

i. This unit depends on—

(1) HHC, engineer construction battalion, TOE 5-116, for organizational maintenance of radios, and for medical support.

(2) Personnel service company, TOE 12-67, for direct support personnel services.

(3) Finance service team, TOE 14-500, for finance services.

F-43. Organization

This unit is organized under TOE 5-118. See figure F-8.

F-44. Duties and Functions

The engineer construction company receives orders and construction directives from HHC, engineer construction battalion. When performing specialized construction tasks, this company may be augmented by personnel and equipment from supporting elements. The company is normally employed on a task or mission basis, and functions as follows:

a. The engineer construction company is composed of a company headquarters, an equipment maintenance section, an horizontal construction platoon, a vertical construction platoon, and a special skills platoon.

b. Company headquarters provides command and administration, all supplies except repair parts, communications with organic elements, and

planning and supervision of company construction operations.

c. Equipment maintenance section performs organizational maintenance of wheeled vehicles and power generation equipment, company-level maintenance of engineer equipment, and supports these functions by maintaining equipment records and prescribed load list (PLL) repair parts. Emphasis is placed on jobsite maintenance of engineer equipment to prevent time consuming, manpower-wasting evacuation of mission equipment from jobsites.

d. Horizontal construction platoon consists of a platoon headquarters, an embankment-excavation section, and a grading-compaction section. It performs embankment, excavation, grading, and compaction for roads, airfields, railroads, and area development.

e. Vertical construction platoon consists of a platoon headquarters, two carpenter sections, and a support section. The platoon erects building and structures.

f. Special skills platoon consists of a platoon headquarters, electrician section, plumber section,

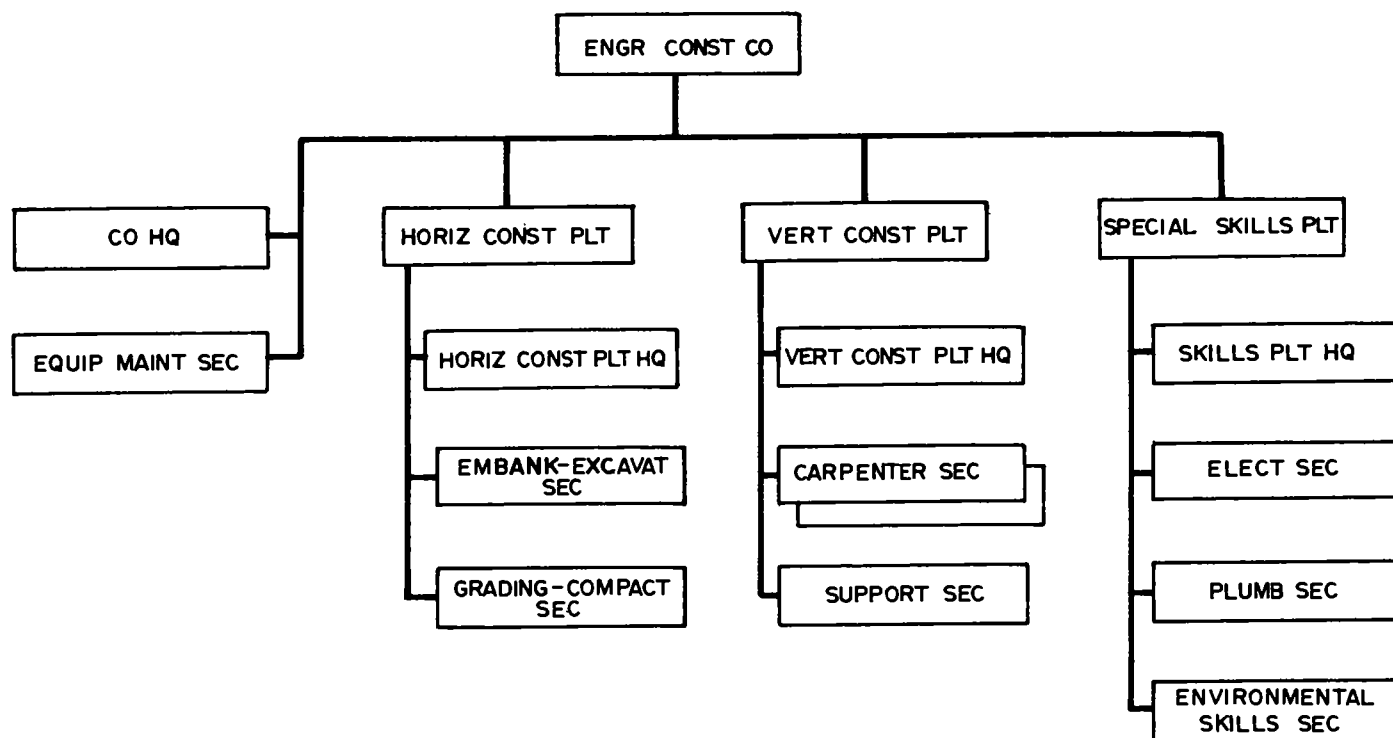


Figure F-8. Organizational chart, engineer construction company, engineer construction battalion.

and an environmental skills section. The platoon installs high-voltage electrical service to buildings and structures, installs electrical systems and power consuming equipment, heating plants, and refrigeration and air conditioning equipment.

F-45. Basis of Allocation

Three per engineer construction battalion, TOE 5-115.

F-46. Category

This unit is designated a category II unit (AR 310-25).

F-47. Mobility

- a. Eighty percent mobile using organic vehicles.
- b. Ninety percent air transportable by US Air Force aircraft. (Seven wheeled tractors and four towed scrapers exceed C-5A floorload capability.)

F-48. Employment

The engineer construction company is the basic work unit of the engineer construction battalion. It may be used as an integral part of the battalion on large projects, or as a separate unit on company-size projects.

F-49. Relationship of Higher, Subordinate, and Adjacent Units

The engineer construction company is subordinate to HHC, engineer construction battalion and normally operates under the control of the battalion commander. The engineer equipment and maintenance company, provides support to the engineer construction company as directed by the CO, engineer construction battalion. There are no organic units subordinate to the engineer construction company.

F-50. Major Items of Equipment

Major items of equipment organic to the engineer construction company include the following: scoop loaders; tractors; dump trucks (5-ton); water distributors; road graders; compaction equipment; wheeled tractor scrapers; wood working equipment sets; crane-shovels with attachments for earth and aggregate loading; pile driving equipment; pneumatic tool and compressor outfits; and various specialized tool sets.

F-51. Communications

Figures F-9 and F-10 illustrate the wire and radio communications diagrams pertaining to the engineer construction company.

F-52. Summary of Changes

- a. *Mission.* No change.
- b. *Assignment.* No change.
- c. *Capabilities.* Delete capability to perform 2-shift operations without augmentation.
- d. *Basis of Allocation.* No change.
- e. *Category.* No change.
- f. *Mobility.* Reduced by 7 percent.
- g. *Personnel.*

	OFF	WO	EM	AGGR
(1) Basic TOE -----	5	1	190	196
(2) Augmentation -- --	--	--	21	21
(3) Total -----	5	1	211	217
(4) TOE 5-118G ---	5	1	203	209

h. Organization.

- (1) Add construction skill spaces.
- (2) Delete second shift operators.
- (3) Net decrease of 13 personnel in basic table.
- (4) Net decrease of eight personnel including augmentation.

i. Equipment.

	5-118G	5-118H
(1) <i>Aircraft</i> -----	None	None
(2) <i>Missiles</i> -----	None	None
(3) <i>Crew weapons and combat vehicles:</i>		
Launcher 40mm -----	7	6
MG 7.62mm -----	6	6
(4) <i>Tactical vehicles:</i>		
Truck Cgo ¾T -----	6	7
Truck Cgo 2½T -----	5	4
Truck Cgo 5T -----	2	2
Truck Dp 5T -----	12	12
Truck Tractor 10T -----	6	6
Truck Util ¼T -----	4	4
(5) <i>Communications:</i>		
Power Supply PP-2953/U	1	1
Radio Set VRC-46 -----	3	3
Radio Set VRC-47 -----	2	2
Control Group GRA-39 --	1	1
Switchboard SB-22 -----	1	1
Telephone TA-312/PT --	8	8

(6) Other support equipment:

	5-118G	5-118H
Compressor 5 CFM ----	1	1
Crane Trk Mtd 20T ----	2	1
Detecting Set Nonmetallic	1	1
Detecting Set Metallic ---	2	2
Distributor Water Trk		
Mtd 1000 G ----	2	2
Gen Set 1.5 KW AC ----	3	2
Gen Set 3 KW AC ----	2	2
Gen Set 3 KW DC ----	0	1
Gen Set 5 KW AC ----	8	8
Gen Set 10 KW ----	2	2
Grader Mtz 6×4 ----	3	3
Hammer Piledriver SP --	1	1
Heater Duct 250 K BTU --	1	1
Loader 2½ CY ----	2	2
Lubricating Unit ----	1	1
Mixer Concrete Trlr		
Mtd 16 CF ----	2	2

5-118G 5-118H

Pneumatic Tool Outfit		
Tlr Mtd ----	2	2
Pump Centrfr Pneu 210		
GPM ----	4	4
Pump Recip GED 100		
GPM ----	2	2
Roller Mtz 3 W 10T ----	1	1
Roller Towed Pneu Tire		
13 W 9T ----	1	1
Roller Towed SF 2 Dr ---	2	2
Saw Chain 18 In ----	2	2
Scraper Towed 18 CY ---	4	4
Semitrailer Low Bed 25T	6	6
Shop Equip Con Maint		
Trk Mtd ----	1	1
Shop Equip Wood Tlr Mtd	2	2
Spray Outfit 1G ----	1	1
Tank and Pump Unit ----	2	2

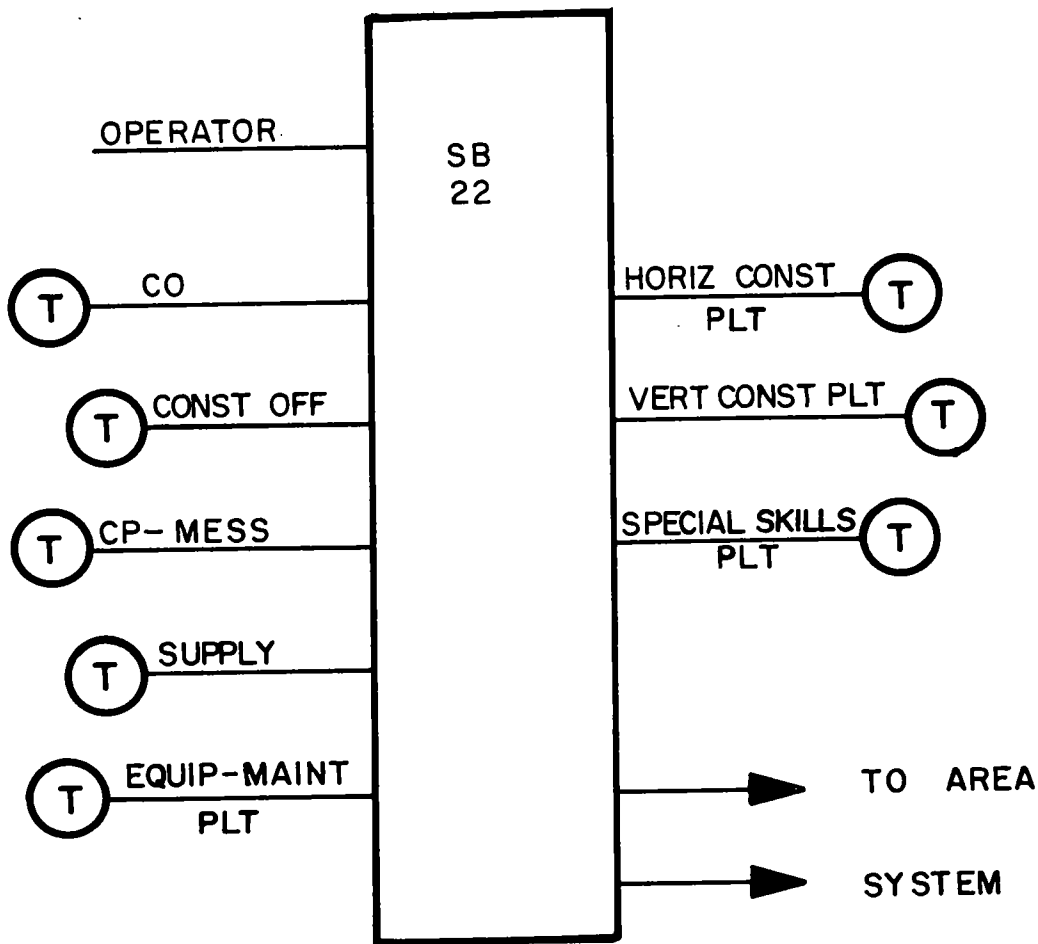


Figure F-9. Wire net, engineer construction company, engineer construction battalion.

5-118G 5-118H

5-118G 5-118H

Tool Outfit Pioneer Tlr Mtd	2	2
Tractor FT Mdm Winch	2	2
Tractor FT Mrm Ripper	2	2
Tractor Whl Mdm	7	7
Trailer Cable 3½T	0	1
Trailer Cgo ¼T	4	1
Trailer Cgo ¾T	4	1
Trailer Cgo 1½T	7	8
Trailer Flat 10T	2	1
Trailer Tank Water	1	1

Truck Maint Pole Set	0	1
Welding Shop Tlr Mtd	1	2
(7) Other construction equipment:		
Adapter Piledriver Lead	2	1
Anvil	1	1
Book Set Cbt Gp	1	1
Boom Ext 10 Ft	1	1
Boom Jib 15 Ft	0	1
Bucket Clam ¾ CY	2	1
Bucket Concrete 1 CY	0	1

TO ENGR CONST BN COMD NET (FM-VOICE)

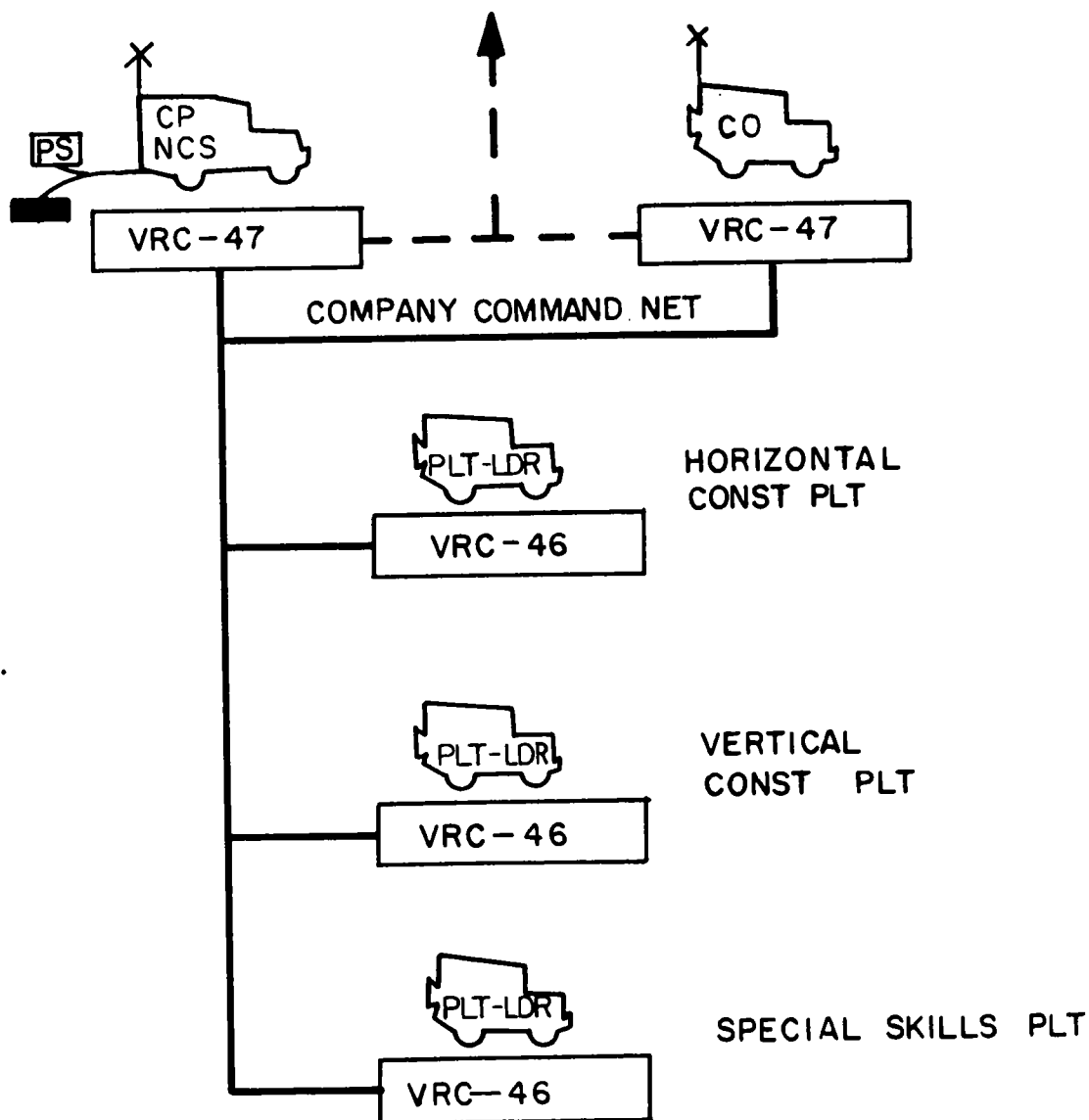


Figure F-10. Radio net, engineer construction company, engineer construction battalion.

	5-118G 5-118H	
Bucket Drag $\frac{3}{4}$ CY -----	2	1
Catwalk Piledriver -----	2	1
Demolition Set -----	4	4
Driver Projectile -----	1	1
Fairlead -----	2	1
Floodlight Set -----	8	8
Lead Section Lower -----	4	2
Lead Section Top -----	2	1
Tagline -----	2	1
Tamper Pneu -----	2	2
Tool Kit Carp Engr Plt --	0	15
Tool Kit Elec -----	2	10
Tool Kit Lineman -----	0	6

	5-118G 5-118H	
Tool Kit Mason -----	4	4
Tool Kit Pion Engr Plt --	2	2
Tool Kit Pipe 2 In -----	0	12
Tool Kit Pipe 4 In -----	2	2
Tool Kit Rigging -----	4	4
Tool Kit Refr -----	0	4
Tool Kit Sheet Metal ----	2	5
Treedozer -----	2	2
Vibrator Concrete Pneu --	4	4
Wheelbarrow 6 CF -----	0	12
Service Kit Power Line Maint -----	0	3

Section V. ENGINEER CONSTRUCTION SUPPORT COMPANY, DPTOE 5-114H

F-53. Mission

To provide rock crushing, bituminous mixing, paving, well drilling and other construction support equipment with operators and thereby increase the capabilities of the construction group in major horizontal construction projects such as highways, storage facilities, and airfields.

F-54. Assignment

Normally assigned to the engineer command for further assignment to an engineer construction group, TOE 5-112.

F-55. Capabilities

a. At level 1, this unit provides—

(1) Support to one engineer group engaged in construction projects.

(2) Up to 225 tons per hour of crushed rock and sand from rock quarries and gravel pits.

(3) Up to 225 tons per hour of washed and sized precrushed rock.

(4) Up to 150 tons per hour of bituminous mixes and blends for paving projects.

(5) Equipment with operators to support construction operations (less bituminous) on a 2-shift basis.

(6) Equipment and personnel to conduct quarrying operations on a 2-shift basis.

(7) Equipment and technical personnel for one shift bituminous paving operations.

(8) Equipment with operators to support well-drilling operations.

(9) The capability to supervise contract labor and indigenous personnel, and to assist in the supervision of contract construction.

b. The columns under levels 2 and 3, adapt this table for reduced operational capabilities in decrements of 10 percent to approximately 90 percent for level 2, and 80 percent for level 3.

c. The capabilities of a type B organization are the same as those of a level 1 organization.

d. The columns designated by levels 1 through 3 are designed to relate to the categories established by AR 220-1 and AR 135-8, Unit Readiness.

e. Additional construction equipment with operator and technical personnel may be provided from appropriate teams available to the theater commander.

f. The capabilities of this unit are increased to the extent provided by the augmentation personnel and equipment.

g. Individuals of this organization can engage in effective, coordinated defense of the unit's area or installation.

h. This unit performs organizational maintenance of organic equipment except communications equipment; direct support maintenance of engineer equipment and power generation equipment.

i. This unit depends on:

(1) HHC, engineer construction group, TOE 5-112 for organizational maintenance of communications equipment.

(2) Personnel service company, TOE 12-67, for direct support personnel services.

(3) Finance service organization, TOE 14-500, for finance services.

(4) Medical department organization, TOE 8-620, for unit level medical support.

F-56. Organization

The engineer construction support company consists of a company headquarters and four specialized operating platoons and is organized under TOE 5-114 (fig F-11).

F-57. Duties and Functions

Add the capability within the equipment platoon to manage, supervise, and operate well drilling equipment, and the increased responsibilities incurred by the addition of the 225-tons-per-hour (tph) crushing and screening plant. Only minor changes occur in the other operating platoons as compared to TOE 5-114G.

F-58. Basis of Allocation

One per engineer construction group, TOE 5-112.

F-59. Category

This unit is designated a category II unit. (Reference unit categories, AR 310-25.)

F-60. Mobility

Fifty percent mobile in organic vehicles.

F-61. Employment

The company is employed in general support of the engineer construction group, TOE 5-112.

F-62. Major Items of Equipment

Changed to add 225 tph crushing and screening plant with accessories; and well-drilling equipment.

F-63. Communications

See figures F-12 and F-13.

F-64. Summary of Changes

a. *Mission.* No change.

b. *Assignment.* No change.

c. *Capabilities.*

(1) Add well drilling capability.

(2) Change crushing and screening capability from 75 tph to 225 tph.

(3) Change bituminous material production from 120 to 150 to "up to 150 tph of bituminous mixes and blends."

d. *Basis of Allocation.* No change.

e. *Category.* No change.

f. *Mobility.* No change.

g. *Personnel.*

	5-114G	5-114H
(1) Officers -----	5	5
(2) Warrant officers -----	1	1
(3) Enlisted men -----	156	205
(4) Aggregate -----	162	211
(5) Augmentation -----	None	1
(6) Total -----	162	212

h. *Organizational.* No change.

i. *Equipment:*

(1) Mission

	5-114G	5-114H
Asphalt Plant 120 tph ----	1	1 (150 tph)
Crane Crawler 40T -----	4	4
Crane Truck Mtd 20T ----	1	1

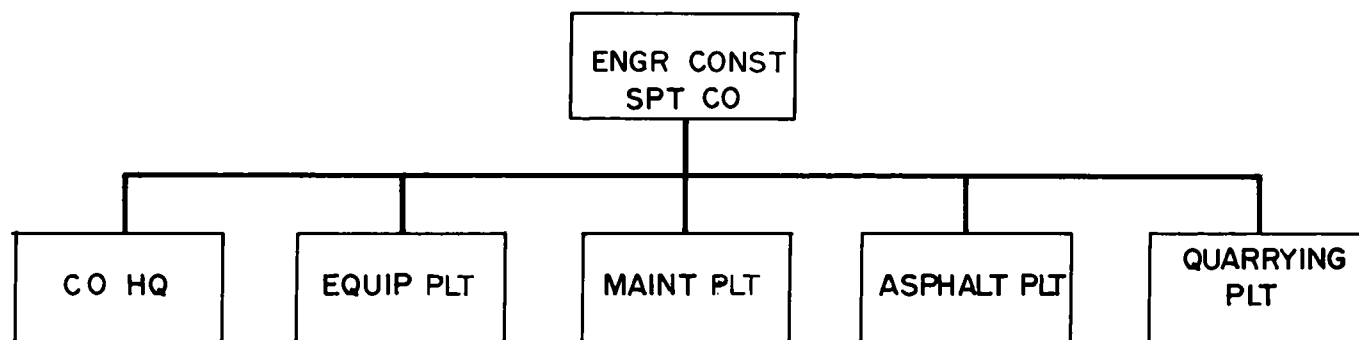


Figure F-11. Engineer construction support company.

	5-114G	5-114H
Crushing Plant 75 tph ---	1	1 (225 tph)
Bin, Aggregate -----	2	4
Distributor Bit 800 Trk Mtd -----	1	1
Distributor H2O Trk Mtd	1	1
Ditching Machine Whl Mtd	1	1
Drill Mach, Well, 1500 Ft	0	1
Paving Machine -----	1	2
Pneu Tool Outfit Tlr Mtd	2	2
Rock Drill Equip -----	1	1
Roller 5-8T Mtz -----	2	2
Roller 9-14T Mtz -----	1	1
Roller 13 Whl Towed ----	2	2
Shop Eq Const Maint Trk Mtd -----	1	1
Shop Eq Org Lt Trk Mtd	1	1
Spreader Aggr Towed ----	2	2
Sweeper GED Towed ----	2	2
Tank and Pump Unit ----	1	1

	5-114G	5-114H
Test Set Asphalt -----	1	1
Tractor FTLS Mdm Winch	2	2
Tractor Whl Mdm -----	2	2
Truck Dump 20T -----	4	4
		(Quarry Wagon -22T)
Truck Forklift RT -----	1	1
Wash-Screen Plant -----	1	0
Welding Shop Tlr Mtd ---	1	1
(2) Vehicles.		
Truck Utility 1/4 T -----	5	5
Truck Cargo 3/4 T -----	1	1
Truck Cargo 2 1/2 T -----	5	4
Truck Cargo 5T -----	0	1
Truck Tank 2 1/2 T -----	1	1
Truck Dump 5T -----	5	5
Truck-Tractor 5T -----	4	4
Truck-Tractor 10T -----	4	4
Truck Wrecker 5T -----	1	1

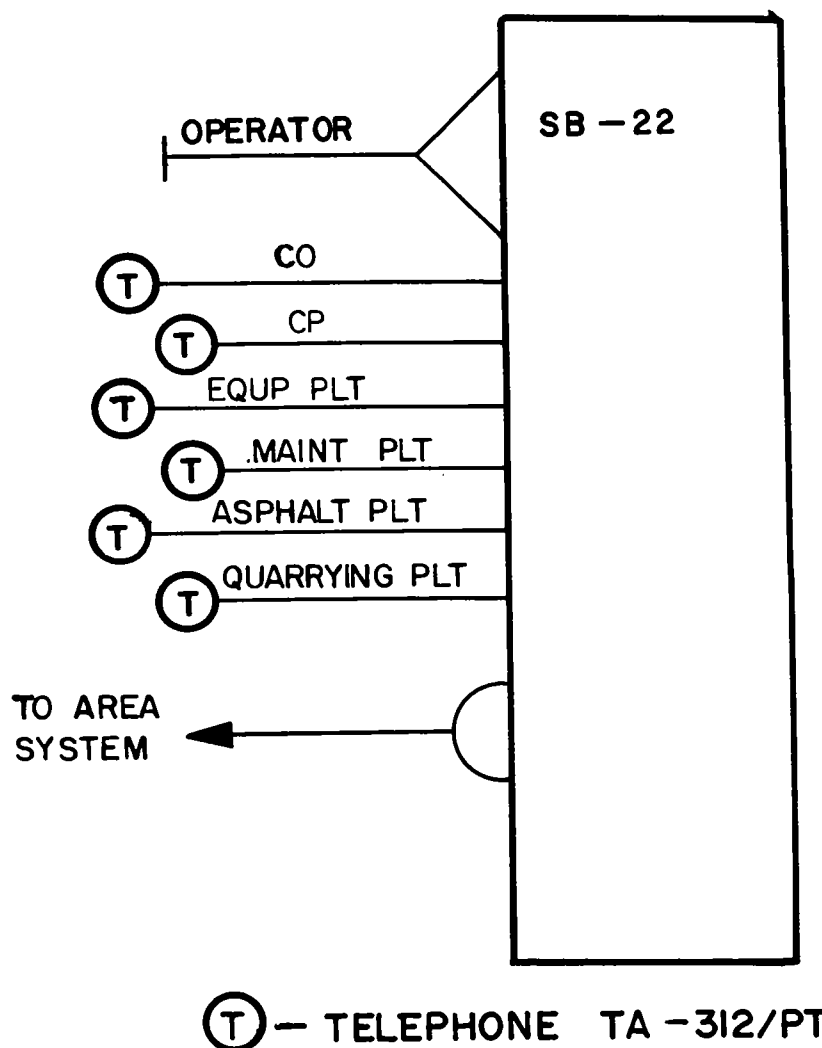


Figure F-12. Wire net, engineer construction support company.

5-114G 5-114H

5-114G 5-114H

Semitrailer low bed 25T	2	2
Semitrailer low bed 60T	4	0
Semitrailer HET 52T	0	4
Semitrailer 5,000 Gal	1	1
Semitrailer Van 6T	1	1

(3) Radios.

VRC-46	3	3
VRC-47	2	2

(4) Weapons.

MG 7.62mm	9	9
MG Cal. .50	0	1

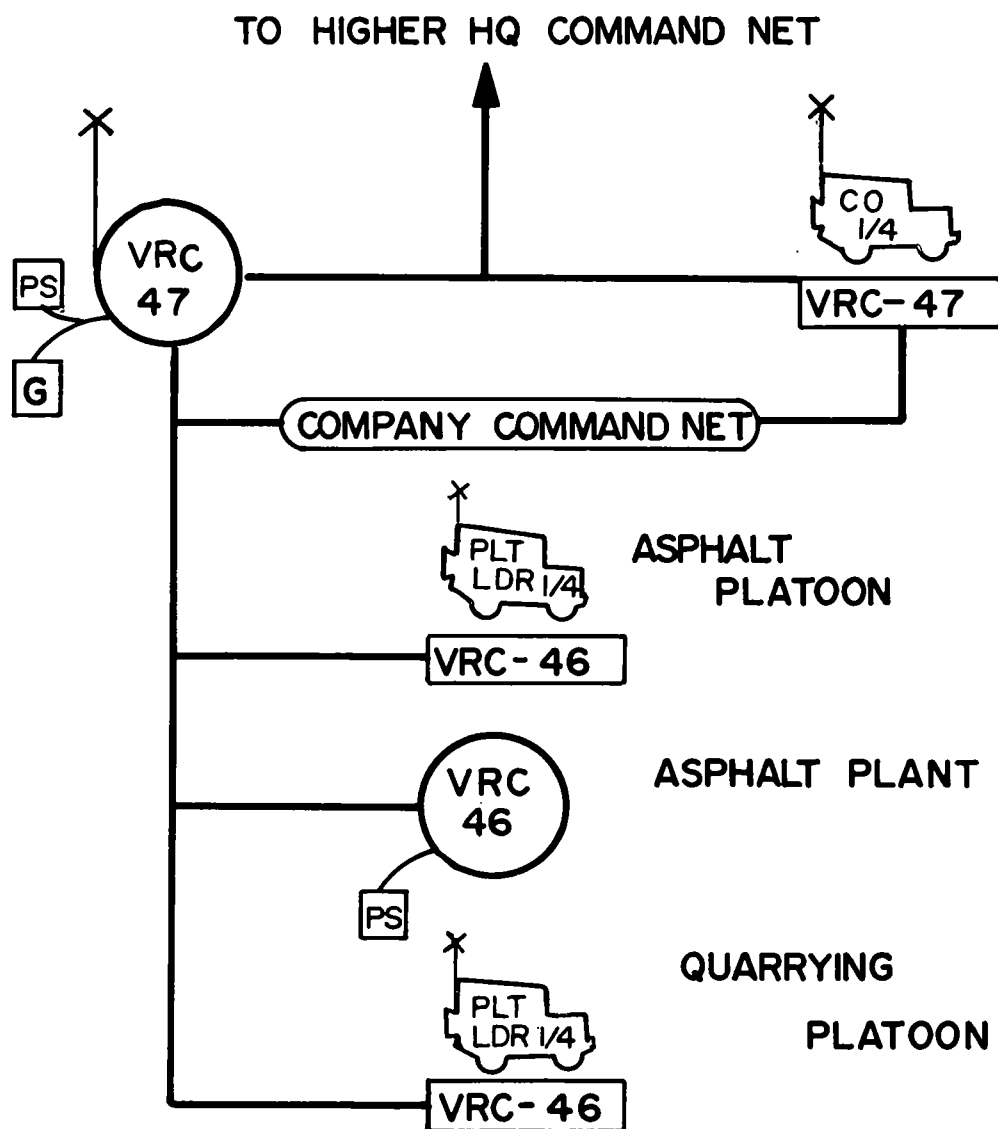


Figure F-13. Radio net, engineer construction support company.



APPENDIX G

ENGINEER PORT CONSTRUCTION BATTALION, TOE 5-165T

This appendix is provided as interim guidance for planners who require information about the engineer port construction battalion, TOE 5-165T. The TOE for the battalion and its organic units are designated as "tentative TOE." The purpose of a tentative TOE is to provide an experimental organizational structure, including personnel and equipment, upon which a troop test can be based. The information in this appendix does not reflect approved DA doctrine or concepts.

Section I. ENGINEER PORT CONSTRUCTION BATTALION

G-1. Mission

a. To construct or rehabilitate offshore and waterfront facilities of theater of operations ports that are required to unload all types of cargo, including petroleum, oils, and lubricants (POL), from small harbor craft and large oceangoing vessels.

b. To plan for, coordinate, and (as appropriate) supervise the activities of other units that may be assigned to assist in the overall development or rehabilitation of major port facilities.

G-2. Assignment

To a theater army support command (TASCOM) for further assignment to headquarters and headquarters company, engineer command, TOE 5-201 or headquarters and headquarters company, engineer construction brigade, TOE 5-111.

G-3. Capabilities

a. At level 1, this unit—

(1) Provides an engineer staff for command, planning, and supervision of organic and attached engineer units engaged in port or port facility construction tasks.

(2) Plans, designs, and executes all facets of marine and waterfront new construction and improvement or rehabilitation of existing ports and port facilities.

(3) Installs or rehabilitates tanker unloading facilities to include submarine pipelines and limited construction or rehabilitation of onshore POL storage facilities.

(4) Constructs piers, wharves, quays, jetties, groins, breakwaters, and moorings and erects spud pier barges and roll-on-roll-off facilities.

(5) Performs direct support maintenance on organic construction, marine, and power generation equipment.

(6) Performs reconnaissance and accomplishes construction site survey to include subaqueous survey for underwater construction.

b. Levels 2 and 3. See paragraph 2-4*a*.

c. Type B Unit. The capabilities of a type B organization are the same as those of a level 1 organization (TOE 5-167T).

d. This unit depends on the personnel service company that services the area for personnel and administrative functions; finance direct support company for finance services; and other headquarters or organizations for medical services.

e. Individuals of this organization, except chaplains and medical personnel, can engage in effective, coordinated defense of the unit's area or installation.

G-4. Organization

See discussion for individual companies (fig. G-1).

G-5. Duties and Functions

The duties of the battalion commander and his staff, with variations peculiar to port construction, are similar to those of the engineer construction battalion and are outlined in FM 101-5, AR 611-101, AR 611-112, and AR 611-201.

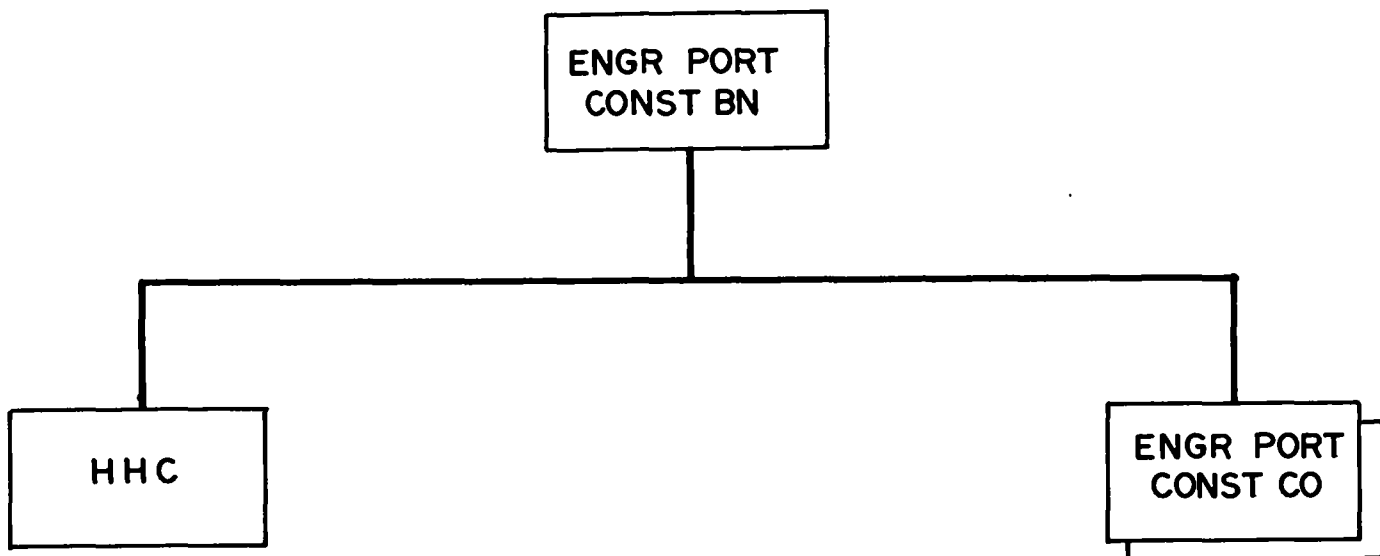


Figure G-1. Organizational chart, engineer port construction battalion.

G-6. Basis of Allocation

As required, normally one per theater army support command.

G-7. Category

This unit is designated a category III unit (AR 310-25).

G-8. Mobility

Refer to the mobility paragraphs of TOE 5-166T and 5-167T.

G-9. Employment

The engineer port construction battalion's activities are normally located in the communications zone (COMMZ). On occasion, however, the battalion may function within the field army area (combat zone), particularly when working on inland waterway ports or during the early stages of construction and rehabilitation of port facilities

before a COMMZ is established. For more specific details, see sections addressing the organic companies.

G-10. Major Items of Equipment

The major items of equipment of the engineer port construction battalion include: crane-shovels, with attachments for dredging, excavating, and pile driving; barge assembly sets; construction equipment; submarine pipeline; diving equipment; landing craft mechanized (LCM); diesel-powered outboard propelling units; tractors; tug; picket boat; dump trucks and DS maintenance shop equipment sets.

G-11. Communications

Communications to higher or adjacent units are by telephone where wire tie-in is provided by area signal units. Internal communications are by radio and telephone.

Section II. HEADQUARTERS AND HEADQUARTERS COMPANY, ENGINEER PORT CONSTRUCTION BATTALION

G-12. Mission

a. To command and control assigned or attached units engaged in construction or rehabilitation of ports and port facilities, to include waterfront construction and marine POL facilities in support of military operations.

b. To provide specialized heavy construction

and marine equipment with operators to increase the construction capabilities of the port construction companies, TOE 5-167T.

G-13. Assignment

Organic to the engineer port construction battalion, TOE 5-165T.

G-14. Capabilities

a. At level 1, this unit—

(1) Provides command, control and staff planning and technical supervision for two to four engineer port construction companies, and engineer cellular teams or other attached units engaged in port construction activities.

(2) Provides design and detailed planning to include preliminary and final surveys, construction layouts, site adaptation, and preparation of bills of material.

(3) Plans for, coordinates, and provides technical supervision over other units that may be attached to assist in the overall development or rehabilitation of port facilities.

(4) Provides staff supervision of administration; training and operations; supply and maintenance.

(5) Provides battalion radio communications and wire communications to subordinate units.

(6) Provides company supply, mess, and organizational maintenance for organic equipment.

(7) Provides specialized equipment and personnel to support the construction effort of the battalion.

(8) Provides direct support (DS) maintenance for organic construction, marine, and power generation equipment.

b. Levels 2 and 3. See paragraph 2-4a.

c. Type B Unit. The capabilities of a type B organization are the same as those of a level 1 organization.

d. This unit depends on the personnel service company that services the area for personnel and administrative functions; finance DS company for finance services; and other headquarters or organizations for medical services.

e. Individuals of this organization, except the chaplain and medical personnel can engage in effective, coordinated defense of the units area or installation.

G-15. Organization

The headquarters and headquarters company, engineer port construction battalion, TOE 5-166T, is designed to provide the necessary personnel for command and staff for an engineer port construction battalion consisting of two to four engineer port construction companies; cellular teams, as

required, and other organizations required for development or rehabilitation of ports and port complexes (fig. 6-2). On the basis of broad policy guidance and specific mission task assignments, this headquarters develops detailed plans for construction projects; establishes priorities, allocates tasks to subordinate operating units; provides technical advice; and coordinates all activities to insure the most effective utilization of personnel and equipment to enhance the timely completion or support to the overall port construction mission(s).

G-16. Duties and Functions

a. *Battalion Headquarters.* Includes the battalion commander, executive officer, principal staff officers, and the sergeant major. Each staff officer advises the commander in his staff area of responsibility and supervises the functions of the appropriate staff element. An engineer equipment officer is provided to assist the commander on matters pertaining to the assignment, utilization, and availability of engineer and marine equipment. He maintains close liaison with assigned or attached units and, as an additional duty, serves as the battalion motor officer.

b. *Company Headquarters.* Provides the company commander and necessary personnel and equipment for unit level administration, supply, mess, and training. The company commander performs the functions of a headquarters commandant for the battalion headquarters.

c. *Administration and Personnel Section.* Operates under the supervision of the adjutant (S1) and performs the consolidated administrative and personnel functions of the battalion, to include message center and mail delivery. The section provides administrative personnel, including personnel specialists, clerk typists, and messengers, to accomplish its prime function. When organizations are attached, the personnel specialists from attached units will be consolidated under the supervision of this section. Light vehicle drivers (radio telephone operators) have been assigned in this section to drive the battalion commander, executive officer, and message center vehicles. The personnel functions may seem to duplicate the functions of a personnel administration company; however, this battalion will normally move into an area to perform its mission well in advance of the establishment of any personnel service units, and it is essential that battalion personnel functions be maintained on a continuous basis.

d. Operations Section. The operations officer (S3) supervises this section and is responsible for the preparation of guidance relative to mission assignments, employment of assigned and attached units, establishment of training policies and programs, preparation of design plans and detailed drawings for site adaption, bills of material, and accomplishment of site layout surveys. Personnel of this section also provide technical advice and perform necessary inspections to insure the completion of battalion projects as specified in the construction plans. The assistant operations officer is responsible for formulating the operational plans for accomplishing assigned construction missions and training programs of the battalion. The marine diving officer supervises diving operations, and is responsible for the preparation of plans and policies pertaining to diving missions. The port construction officer and the assistant port construction engineer are responsible for assisting in the preparation of plans and bills of material relating to port construction projects. The pipeline engineer is responsible for the preparation of plans for submarine pipeline installation

and POL facilities. The operations sergeant is the principal NCO of the section and is responsible for assisting and advising personnel of the section and supervising the other enlisted men assigned. The intelligence sergeant performs those intelligence functions relative to port construction projects. The construction inspector, the pipeline construction inspector, and assistant construction inspector assist in the inspection of projects throughout the battalion in their respective fields. Two construction survey teams, supervised by a chief construction surveyor, have been provided to perform construction surveys needed to support the battalion's construction effort. When underwater or subaqueous survey is dictated, personnel from the diving section will assist. The design draftsman, senior construction draftsman and two construction draftsmen prepare the necessary construction plans and assist in the preparation of bills of material. A senior soils analyst and a soils analyst are provided to test soils. The still photographer assists in performing reconnaissance and records progress of construction tasks through the use of photography.

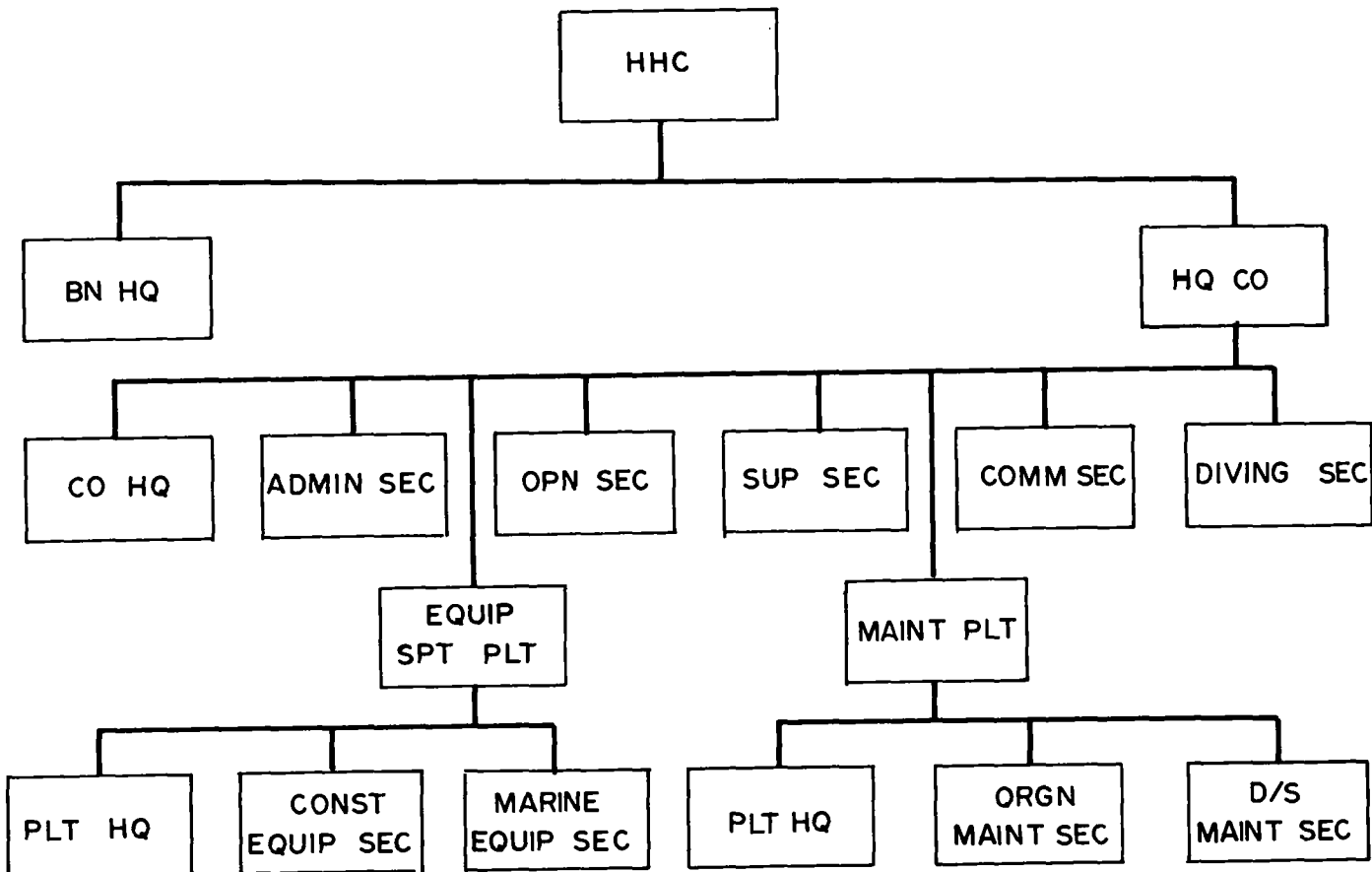


Figure G-2. Organizational chart, HHC, engineer port construction battalion.

e. Supply Section. The supply officer (S4) is responsible for the supply functions of the battalion, to include the procurement of Class IV construction materials to support the construction mission of the battalion. A warrant officer (unit supply technician) has been provided to assist the S4 in performing the operational battalion level supply function.

f. Communications Section. Provides personnel and equipment to operate the battalion radio net control station and provides wire communication for internal elements of the headquarters and headquarters company and to subordinate units.

g. Medical Section. Under the direction of the battalion surgeon, this section provides personnel and equipment for the operation of a battalion aid station, evacuation of the sick and wounded, and unit level medical support to assigned or attached units. Company aidmen have been provided on the basis of two per operating company on the assumption that the battalion will normally be organized as illustrated in figure G-2. The battalion aid station is manned by the clinical specialist, the senior medical aidman, the medical aidman and the aid station attendant.

h. Diving Section. This section is employed under the direction of the battalion S3 to provide diving support to the various elements of the battalion. It performs the necessary underwater explorations required in the development of design plans and site adaptation for port construction projects, assists in salvage and clearance operations, and may be utilized to augment or assist the divers of the port construction companies in accomplishing underwater construction tasks; to include welding, demolitions and the removal of debris.

i. Equipment Support Platoon. This platoon is organized with a platoon headquarters, a construction equipment section, and a marine equipment section. It provides floating marine equipment, such as landing craft, tug, crane-mounted barges, and other associated equipment required to augment or support the port construction companies engaged in waterfront construction. When augmented by divers, this platoon can accomplish limited salvage and debris clearance.

j. Maintenance Platoon. Is organized with a platoon headquarters, a direct maintenance section, and an organizational maintenance section. It accomplishes organizational maintenance for all construction, power generation, marine and auto-

motive equipment organic to the headquarters and headquarters company; and provides direct support maintenance for construction, marine and power generation equipment organic to the headquarters and headquarters company. Personnel and equipment have been provided so that maintenance teams may be dispatched to provide on-site repair DS when elements of the company are working at separate locations.

G-17. Basis of Allocation

One per engineer port construction battalion, TOE 5-165T.

G-18. Category

This unit is designated a category III unit (AR 310-25).

G-19. Mobility

For unit displacement this company is 60 percent mobile in organic vehicles. When the unit displaces, additional general-purpose transportation is required for 270 tons of supplies and equipment, (excluding marine and marine-associated equipment) and 44 personnel. Appropriate tugs or other seagoing craft are required to move work barges, barge assemblies and organic watercraft when the unit displaces.

G-20. Employment

The engineer port construction battalion, of which this unit is the headquarters and headquarters company, is established as the major port construction unit, in an area of assignment and is responsible for development of port facilities and related port construction work. The battalion will normally be employed in the communications zone of a theater of operations. Generally it will be assigned to the headquarters and headquarters company engineer command, TOE 5-201; or headquarters and headquarters company, engineer construction brigade, TOE 5-111. In the absence of either of the above headquarters this battalion may be assigned to an engineer construction group for the accomplishment of assigned tasks. The headquarters and headquarters company will be employed in a manner best suited prevailing local conditions and to provide the necessary command, staff planning, and technical supervision over assigned and attached units engaged in port construction activities. Normal relationships will be maintained with other US military elements concerned with or which may be utilizing port facilities, i.e., Army Transportation units or US

Navy elements. This contact or liaison is necessary to facilitate establishing construction requirements, in planning, and in establishing priorities.

G-21. Major Items of Equipment

Major items of equipment organic to the headquarters and headquarters company, engineer port construction battalion, include: barge assembly sets, diving equipment sets, diesel outboard

propelling units, submarine pipeline construction equipment; cranes with pile-driving and limited dredging attachments; picket boat (36 to 47 ft); oceangoing tug (650 hp); and shop equipment maintenance sets (organizational and DS).

G-22. Communication

Communications for internal use is provided by wire/telephone. External communications are shown in figure 6-3.

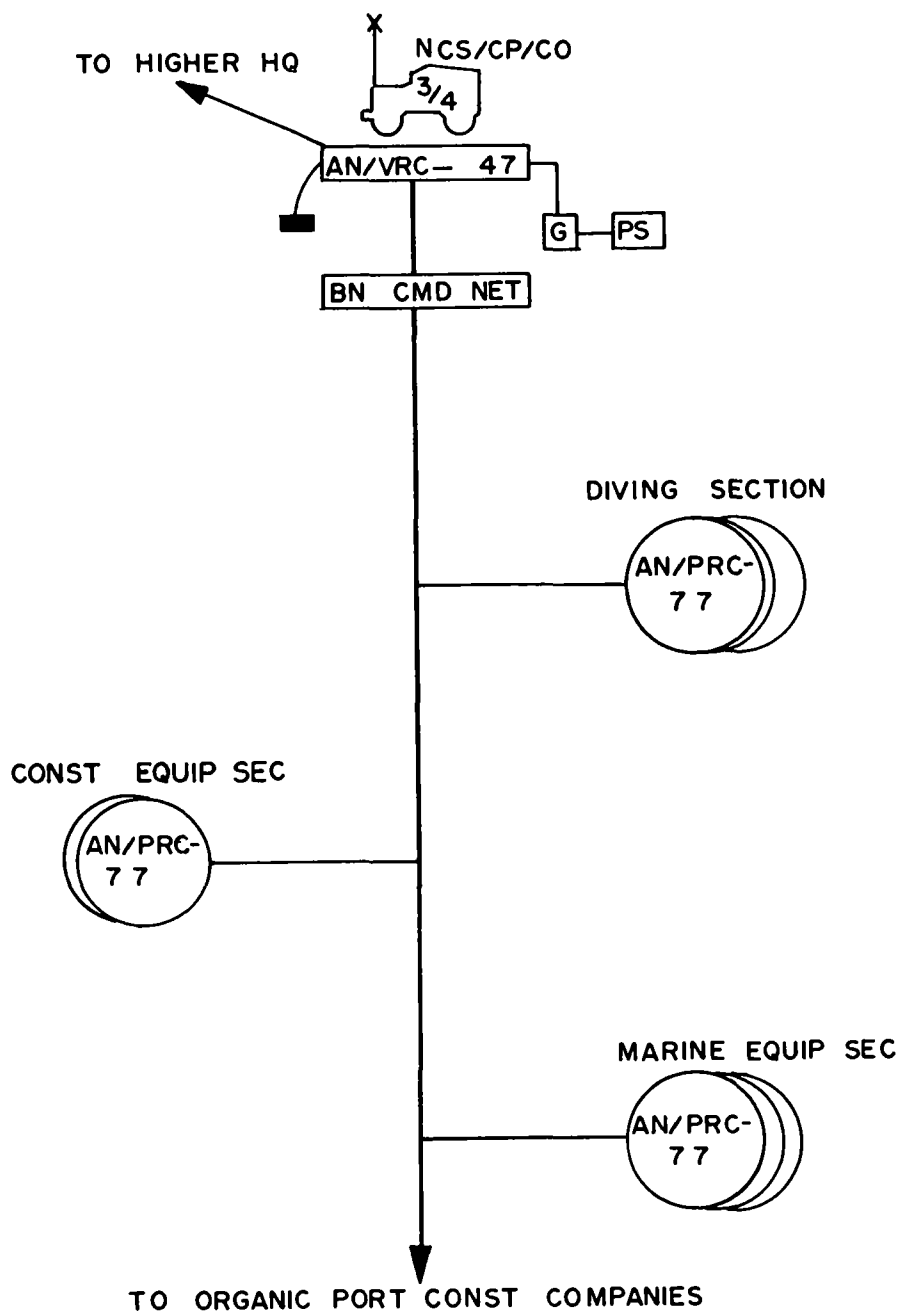


Figure G-3. Radio net, HHC, engineer port construction battalion.

Section III. ENGINEER PORT CONSTRUCTION COMPANY, ENGINEER PORT CONSTRUCTION BATTALION OR ENGINEER PORT CONSTRUCTION COMPANY, SEPARATE

G-23. Mission

To construct, improve, and rehabilitate waterfront facilities to include offshore anchorage systems and submarine pipelines for off-loading petroleum, oil, and lubricants (POL) tankers.

G-24. Assignment

a. Organic to the engineer port construction battalion, TOE 5-165T.

b. To the theater army support command (TASCOM) or other appropriate headquarters with normal attachment to an engineer construction group, TOE 5-112, when less than battalion effort is required.

G-25. Capabilities

a. At level 1, this unit:

(1) Performs general construction tasks in connection with port development to include:

(a) Erection of piers, wharves, quays, jetties, groins, and other structures for use in off-loading oceangoing vessels.

(b) Installation of offshore anchorage facilities.

(c) Installation of submarine and floating pipelines for off-loading POL tankers.

(d) Construction of facilities to handle roll-on-roll-off ships.

(e) Installation of navigational aids.

(f) The erection, operation and maintenance of spud type barge piers.

(g) Repair of canals, locks, and seawall structures.

(2) When augmented with additional equipment and operators, undertakes extensive heavy construction tasks in connection with port development or rehabilitation. Requires support from headquarters and headquarters company when assigned tasks which include the installation of submarine/floating pipelines or offshore anchorage facilities.

(3) Performs organizational maintenance on all organic equipment and direct support maintenance of organic construction, marine and power generation equipment.

(4) Performs 2-shift operations.

b. Levels 2 and 3. See paragraph 2-4a.

c. Type B Unit. The capabilities of a type B organization are the same as those of a level 1 organization.

(1) The type B column adapts this TOE to the lesser requirements for United States military personnel. Vacancies in the type B column indicate the types of positions that can be filled by non-United States personnel. The number of such personnel must be determined by the major commander to whom the unit is assigned and will depend on the capacity of available personnel to produce, the number of shifts, and other local conditions.

(2) Interpreters and translators required when organized under type B column will be provided from appropriate teams available to the theater commander.

d. This unit depends on the personnel service company that services the area for personnel and administrative functions; finance DS company for finance services; and other headquarters or organizations for medical service.

e. When operating as a separate company, additional personnel must be provided from appropriate cellular teams or by MTOE to increase the capability of operations, project design, diving, and supply.

f. Individuals of this organization can engage in effective, coordinated defense of the unit's area or installation.

G-26. Organization

This company is the basic construction element of the port construction battalion: Two of these companies are organic to the battalion. These units will be deployed within the port complex and as near to the actual worksites as possible to facilitate the accomplishment of assigned tasks. Depending on the magnitude and volume of assigned construction tasks, additional construction effort in the form of heavy construction equipment, specialized personnel and critical marine equipment may be attached to these companies from appropriate elements of the headquarters and headquarters company to enhance the timely completion of these tasks (fig. G-4). The port construction company is designed to provide specialized personnel and equipment necessary for a 2-shift operation. The proposed TOE 5-167T is organized with:

a. A company headquarters.

b. A diving section.

c. Two construction platoons which include a platoon headquarters, two general construction squads and a pile-driving section.

d. An equipment support platoon with a platoon headquarters, construction equipment section and marine equipment section.

e. A maintenance platoon with both a direct support section and an organizational maintenance section to include platoon headquarters.

f. A transportation section.

G-27. Duties and Functions

a. *Company Headquarters.* This is the command element of the company which provides the necessary command and supervision, company administration, operations, communications, supply and mess. A port construction engineer supervises operations of the various sections in the company and also acts as the executive officer. The port construction supervisor assists the port construction engineer in the performance of his duties, which include preparation of reports on inspec-

tions, and estimates of labor and material. The construction surveyor and construction survey recorder conduct field surveys, fix locations, and determine angles and distances for company projects. The construction draftsman prepares detailed construction plans for port construction or rehabilitation. The senior field switchboard operator and field wireman operate the switchboard on a 2-shift basis. The field wireman also lays internal field wire to company headquarters, platoons, and sections.

b. *Diving Section.* Provides the diving support required in marine construction, underwater demolition, and debris clearance operations. One diving team is provided to accomplish the functions associated with subaqueous tasks. The team consists of one diving supervisor, two senior divers, one diver, one basic diver and one diver's apprentice.

c. *Construction Platoon.* There are two of these platoons organic to the company. Each platoon is organized with a platoon headquarters, two general construction squads and a pile-driving section. These platoons with their organic sections provide the basic work elements of the company and perform a variety of general engineer construction tasks in support of port construction.

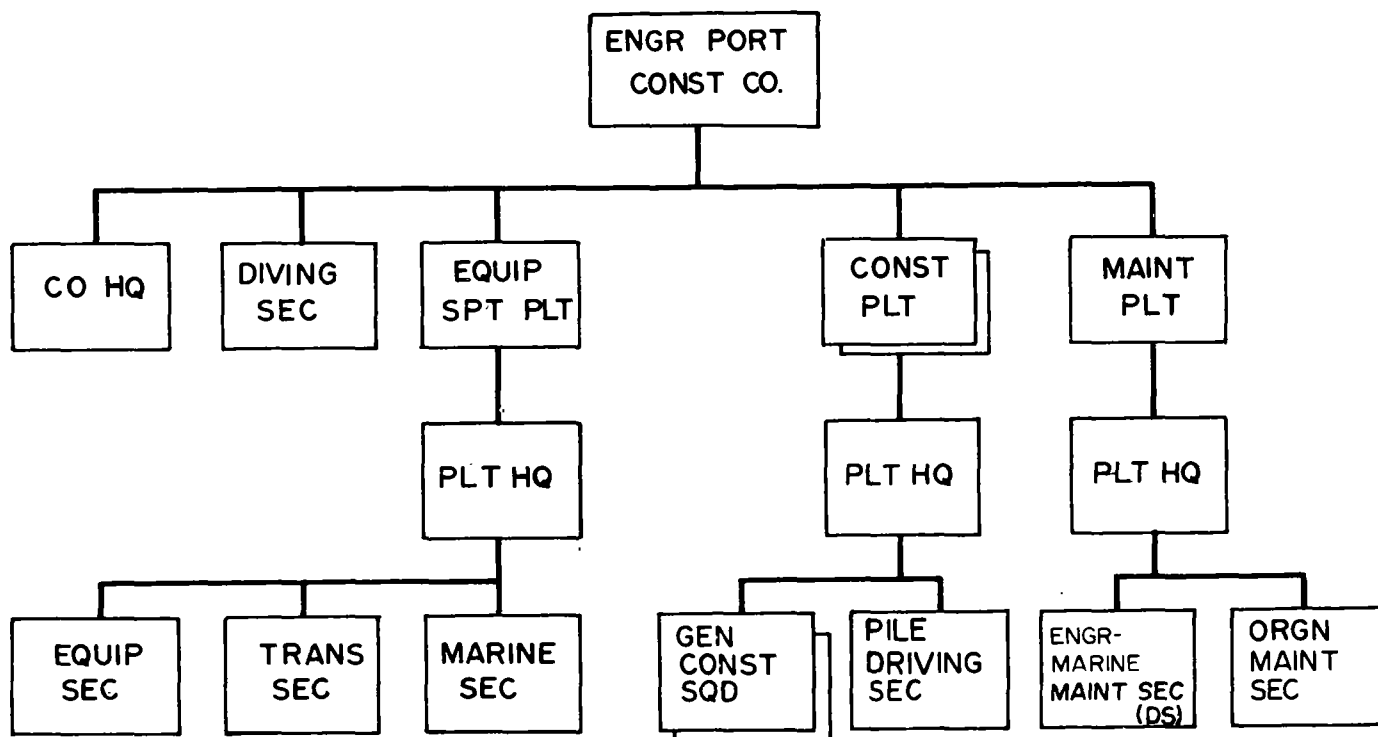


Figure G-4. Organizational chart, engineer port construction company, engineer port construction battalion.

(1) *Two construction platoon headquarters.* Two platoon leaders direct platoon operations. Two platoon sergeants, the principal NCOs of the platoons, assist in the operation and functions of the platoons. Two welder foremen supervise welding and cutting operations performed by the three senior welders, four welders and three welder apprentices. Two masons assist in the construction of forms, lay building blocks and bricks, and supervise concrete mixing, pouring, and curing. Two toolroom keepers are responsible for the maintenance and accountability of the platoons' tools.

(2) *Four general construction squads.* Four squad leaders (NCOs) supervise the squads' operations. Four senior carpenters and 24 carpenters build cribbing, nail or bolt bracing, and lay planking and decking on wharves, piers, and docks. They also build dock bumpers, bolt down dock hardware, and construct forms for concrete work. Four electricians are responsible for providing the electrical facilities in a construction project. Four pipeline specialists and four pipeline apprentices participate in the installation of submarine pipelines. The plumber pipefitters cut and lay pipe and install fittings. Four structures specialists assist in the construction of prefabricated storage tanks, and construction apprentices assist in various construction projects.

(3) *Two pile driving sections.* Two NCO section leaders direct operations. Four senior crane-shovel operators operate the crane-shovels on a 2-shift basis. Four senior piledriver operators operate the pile-driving rig and jetty set on a 2-shift basis. Two senior riggers, six riggers and two rigger apprentices place piles for driving, use wire ropes, double blocks, snatch blocks, and pulleys to move leads to hoist and place piles and assist in the assembly of pile-driving leads. Four air compressor operators operate the 600 CFM compressors and the pneumatic tools.

d. Equipment Support Platoon. This platoon is organized with a platoon headquarters, an engineer equipment section, a transportation section, and a marine equipment section. The platoon provides supplemental construction equipment and marine craft in support of the overall mission of the company.

(1) *Equipment support platoon headquarters.* The platoon leader is responsible for the supervision of the equipment support platoon. The platoon sergeant is the principal NCO of the platoon. He assists the platoon leader in supervising the platoon.

(2) *Engineer equipment section.* The section chief is the section NCO and supervises the operations of the section. Four senior crane-shovel operators are assigned for two shift operation of the two 40-ton crane shovels. Six senior crane-shovel operators and two crane-shovel operators have been provided to operate two 20-ton, truck-mounted cranes on a two shift basis. Three senior loader operators and one loader operator operate the two loaders on a 2-shift basis. Three senior crawler tractor operators and one crawler tractor operator are assigned to operate the two tractors on a 2-shift basis. Four compressor operators are responsible for operation of air compressors and pneumatic tools. Two rough terrain forklift operators are assigned to operate the 5-ton rough terrain forklift on a 2-shift basis.

(3) *Transportation section.* This section provides the prime movers for transporting construction and construction support equipment around and between job sites, and vehicles for hauling heavy construction materials such as timber, steel, or concrete piles, construction timbers, steel cables, and heavy hardware. The section chief is the NCO of the section and is responsible for the direct supervision of the section. Five senior heavy-vehicle drivers, 13 heavy-vehicle drivers, one senior light-vehicle driver, and five light-vehicle drivers are assigned on a 1½-shift basis to drive the 12 heavy trucks and the four light trucks. The assignment of drivers is considered austere and is the minimum requirement which will insure support of the construction effort.

(4) *Marine section.* The section chief is the principal NCO of the section and is responsible for the direct supervision of the section. Two harbor craft NCOs, two landing craft operators, two landing craft crewmen, and two assistant landing craft crewmen are divided into two teams to operate and maintain the two LCM-8. Two harbor craft operators operate the two 27-foot bridge erection boats. Two propelling unit operators operate the propelling units and are the nucleus for training other personnel in operating the numerous barge assemblies.

e. Maintenance Platoon. This platoon is organized with a platoon headquarters, a DS maintenance section, and an organizational maintenance section. This platoon performs organization and battalion-level maintenance on all organic construction and power generator equipment and wheeled vehicles. It also performs DS maintenance on organic construction and power genera-

tor equipment and on marine floating equipment authorized the company.

(1) *Maintenance platoon headquarters.* The engineer equipment repair technician is the section head who directs and supervises operations in this section. The platoon sergeant assists in the supervision of the section. A machinist uses power equipment, such as drill presses and lathes, to fabricate parts for repair of organic equipment. Two repair parts specialists are required to support organizational maintenance of all organic equipment and direct support maintenance of construction, power generator, and marine equipment. These two positions are considered essential for the maintenance of the prescribed load list (PLL) and the authorized stockage list (ASL) in support of the maintenance function. A welder welds and cuts parts necessary for efficient equipment operation.

(2) *Engineer-marine maintenance section (DS).* The engineer equipment maintenance supervisor supervises the DS maintenance section. Two power generator equipment repairmen perform maintenance on power generator equipment and have the capability to perform maintenance at dispersed locations. Two senior engineer equipment repairmen, one engineer equipment repairman, and one engineer equipment repairman apprentice are authorized to accomplish the direct support maintenance of organic construction and related equipment. A marine engine repairman and a marine hull repairman are responsible for the maintenance of the marine equipment. A fuel and electrical system repairman is required to troubleshoot fuel and electrical components.

(3) *Organizational maintenance section.* The engineer equipment maintenance supervisor is the principal NCO and overall supervisor of the organizational maintenance section. The motor sergeant is directly responsible for the maintenance and operation of organic vehicles. Four senior engineer equipment mechanics, eight engineer equipment mechanics and four engineer equipment apprentices perform organizational maintenance on organic vehicles and equipment. These personnel are assisted by a senior vehicle repairman, five wheeled-vehicle repairman and one wheeled-vehicle repairman apprentice. The power generator equipment is maintained by five general-purpose power generator mechanic/operators and two each power generator equipment apprentices. A marine engine mechanic and marine engine mechanic apprentice are utilized as part of the

LCM-8 crew to perform maintenance on the engine and propulsion units of the numerous barges.

G-28. Basis of Allocation

a. Two per engineer port construction battalion, TOE 5-165T.

b. As required, when less than a battalion-size unit is dictated; up to two additional companies may be attached to the port construction battalion when the magnitude of the battalion's assigned tasks warrants an increased effort.

G-29. Category

This unit is designated a category III unit (AR 310-25).

G-30. Mobility

For unit displacement, this company is 45 percent mobile in organic vehicles. When unit displaces, additional general-purpose transportation is required for 336 tons of supplies and equipment (excluding marine and marine-associated equipment) and 59 personnel. Appropriate tugs or other seagoing craft are required to move work barges, barge assemblies and organic watercraft when this unit displaces.

G-31. Employment

a. The employment of the engineer port construction company will normally be as directed by the battalion commander. When detached from the battalion, the company will be directed by the headquarters to which it is attached.

b. Two engineer port construction companies are normally assigned to the engineer port construction battalion, but up to two additional companies may be assigned when the magnitude of the construction task warrants additional effort. These are the working elements of the battalion, providing personnel and equipment to accomplish tasks normally associated with the construction, rehabilitation, and repair of port facilities. When augmented with specialized equipment and operators from the headquarters and headquarters company these companies can accomplish more extensive construction tasks. The engineer port construction company (TOE 5-167T) is basically the same organization as TOE 5-129 with reduced diving, design and supply capabilities to avoid duplicating the services provided by the headquarters and headquarters company. The organization of this company satisfies the previously stated requirement that the unit be capable of undertaking

separate port construction missions at a separate location. This capability is assured by including required construction skills and equipment and a full maintenance capability to keep the company's equipment operating. This unit may be activated as a separate company when a requirement exists for less than a battalion-size force to accomplish a port construction mission. When there is a requirement to increase the effort of the port construction battalion, up to two of these companies may be assigned to the battalion in addition to the two organic port construction companies. When activated as a separate unit not assigned to an engineer port construction battalion, the company must be augmented with operations, diving and supply personnel to give the company design, diving, and class IV supply capabilities commensurate with the role of a separate company.

G-32. Major Items of Equipment

Major items of equipment include the following: barge assembly sets; diving equipment sets; diesel outboard propelling units; crane-shovel with pile-driving attachments; limited dredging capability with dragline and clamshell attachments for crane-shovels; erection sets for bolted steel storage tanks; tractors; landing craft mechanized (LCMs); erection boats (27-ft); and equipment maintenance and repair sets.

G-33. Communications

Internal communications are provided by organic wire/telephone modes. External communications are as noted in figure G-5. Marine vessels are all equipped with both AM for ship-to-ship, and FM for ship-to-shore communications.

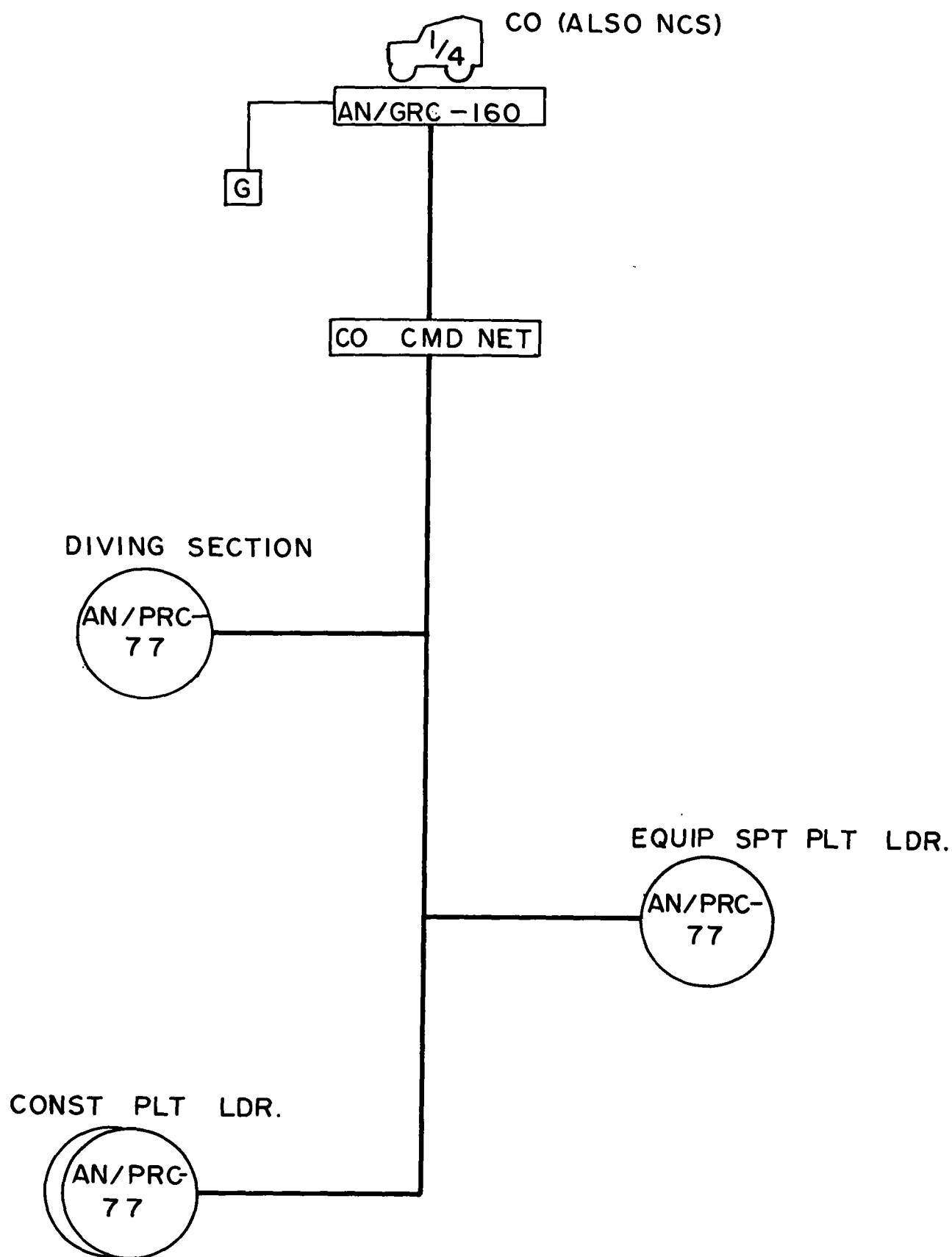


Figure G-5. Radio net, engineer port construction company, engineer port construction battalion.

APPENDIX H

STANAG 2041

DETAILS OF AGREEMENT (DofA)

OPERATIONAL ROAD MOVEMENT ORDERS, TABLES AND GRAPHS

- Annexes: A (DofA). Example of an Operational Road Movement Order.
 B (DofA). Specimen Road Movement Table.
 C (DofA). Example of a Road Movement Graph.

H-1. AGREEMENT

The NATO Armed Forces agree to use the standard layouts for operational road movement orders, road movement tables and graphs as given in annexes A to C (DofA). The instructions given in subsequent paragraphs amplify these layouts.

H-2. ORDERS

Warning orders and operational road movement orders are of primary concern to those responsible for movement by motor transport. However, standing operating procedure/standing orders may also contain information essential to the conduct of movements by motor transport.

a. Warning Orders.

(1) A warning order is a preliminary notice of an order or action which is to follow. It is designed to give subordinates time to make necessary plans and preparations.

(2) A warning order is of value in alerting troops and preparing them for movement before receipt of the detailed operation order for the movement. It may be issued orally or in message form. The fact that it is only a warning order will always be indicated.

(3) A warning order should be as brief as possible but should include the following items when applicable:

- (a) Probable tasks or movements.
- (b) Earliest time of movement or degree of notice.
- (c) Rendezvous and time of order group, if any.
- (d) Orders for movement of reconnaissance or advance parties.

(e) Administrative instructions affecting the resting or feeding of troops, regrouping of transport, and preliminary movements.

(4) Timeliness is the essence of warning orders.

b. Operational Road Movement Orders. (See annex A (DofA).)

(1) An operation order for road movement is an order issued covering the details for the movement of a formation/unit by road.

(2) The order should be issued in sufficient time to allow subordinates to make their plans, issue their orders, and complete their preparations for the movement. The amount of detail given in such orders depends on the tactical and traffic situation, the state of training of the formation/unit, and the extent to which standing operating procedure/standing orders have been completed.

(3) Fragmentary orders may be used; but when time permits, a detailed order is issued in the form of the five-paragraph operation order (STANAG 2014). Annexes to the order may include a road movement table, administrative/logistics annex, etc. When administrative/logistic details are too voluminous for convenient inclusion in the order, an administrative/logistic order or an administrative/logistic annex to the operation order will be issued (STANAG 2032).

c. Standing Operating Procedure/Standing Orders. The following are some headings that may be used as a guide in drafting standing operating procedure/standing orders for a formation headquarters. This list is not complete and will vary

with circumstances, particularly in different theaters of war:

- (1) Composition and duties of advance party.
- (2) Vehicle loads, including personnel.
- (3) Grouping of vehicles and group commanders.
- (4) Organization of columns.
- (5) Sign-posting and traffic control.
- (6) Responsibility for manning start point and release point.
- (7) Discipline; halts; lighting.
- (8) Action in the event of enemy attack.
- (9) Drill for establishing headquarters on arrival.
- (10) Responsibility for issue of operation orders for movements for headquarters.
- (11) Inspection of vacated office sites for security purposes.

H-3. ROAD MOVEMENT TABLES. (See annex B (DofA).)

a. Road movement tables will consist of two parts. One part has data paragraphs reflecting general information or information common to two or more columns (or elements of columns). The other lists the columns (or elements of columns) and all other necessary information in tabular form.

b. These afford a convenient means of transmitting to subordinates their schedules and other essential detail pertaining to road movement. This is particularly so in cases where the inclusion of such detail in the body of the operation order would tend to complicate it or make it unduly long.

c. They will frequently require a wider distribution than a normal operation order so that copies can be issued to movement control personnel, traffic posts, etc.

d. They will be given security classifications in accordance with their contents; but these classifications will not necessarily be the same as those of the operation orders.

H-4. ROAD MOVEMENT GRAPHS. (See annex C (DofA).)

a. Road movement graphs are used by staffs in planning and, when applicable, in supervising or regulating complicated movements, and for providing a convenient means of recording actual moves of units over a period.

b. The unit of measure to be used (kilometers or miles) will depend on the requirements of the authorities concerned. However, the resulting orders and instructions should reflect only one unit of measure.

H-5. EXTRA TIME ALLOWANCE

a. Within a column, moving under one identification serial number, an extra time allowance of 1 minute per 25 vehicles is always allotted above the calculated pass time.

b. If the number of vehicles in a column is more than 600, the extra time allowance allotted will be 2 minutes per 25 vehicles.

H-6. GAPS

Between columns having different serial numbers, no standard gaps are prescribed; these gaps are allotted by the staff ordering the movement.

H-7. IMPLEMENTATION

This STANAG will be considered to have been implemented when the necessary orders/instructions putting the procedures detailed in this agreement into effect have been issued to the forces concerned.

ANNEX A TO THE
DETAILS OF AGREEMENT OF
STANAG 2041

EXAMPLE OF AN OPERATIONAL ROAD MOVEMENT ORDER

(intended as a guide only)

(SECURITY CLASSIFICATION)

Copy No. 4
21st Inf. Div.
YREVA, BLOKSKY,
011030Z January 1972
OPS 27

Operation Order 14:

Map: BLOKSKY, 1/250,000 NOTKLOTS-DRAKCIR

Task Organization/Grouping: Annex A—

Task Organization/Grouping (NOT attached to this example).

Time Zone Z.

1. SITUATION

- a. Enemy Forces: BLOKSKY 42nd Infantry Division (reinforced is delaying advance of V Corps.
- b. Friendly Forces: V Corps attacks early 2d January.
- c. Attachments and Detachments: None.

2. MISSION

21st Infantry Division to move from YREVA at 012030Z January into NAEJ.

3. EXECUTION

- a. 121 Brigade is to move RED route to DRAKCIR and WHITE route to vicinity of NAEJ.
- b. 221 Brigade is to move BLUE route to NOTKLOTS and GREEN route to vicinity of NAEJ.
- c. 321 Brigade follows 121 Brigade.
- d. Division Artillery follows 221 Brigade.
- e. Division Troops follow 321 Brigade.
- f. Miscellaneous.
- g. Coordinating instructions.
 - (1) Annex B—Movement Table
 - (2) First short halt 012150Z January 1972
 - (3) No weapon will be fired at aircraft unless attacked.

4. ADMINISTRATION AND LOGISTICS

Administrative/Logistic Order 19 follows.

5. COMMAND AND SIGNAL

- a. Continue radio silence
- b. Division Headquarters. Head of Division during move.

AVERS
Major-General

Acknowledge

Annex A—Task Organization/Grouping (NOT attached to this example)

Annex B—Movement Table

Distribution:

Authentication:

ANNEX B TO THE DETAILS OF AGREEMENT OF STANAG 2041

SPECIMEN ROAD MOVEMENT TABLE

(A guide only, will need adjustments to suit individual cases)

(SECURITY CLASSIFICATION)

Annex 'B'—"Movement Table" to Operation Order 14
Map: BLOKSKY, 1/250,000 NOTKLOTS-DRAKCIR

Copy No. 4
21st Inf. Div.
YREVA, BLOKSKY
011030Z, January 1972
OPS 27

General Data:

1. Average Speed
2. Traffic Density
3. Halts
4. Routes (i.e. between Start Points and Release Points)
5. Critical Points (See NOTE 4)
 - (a) Start Points
 - (b) Release Points
 - (c) Other Critical Points
6. Main Routes to Start Points (See NOTE 7)
7. Main Routes from Release Points (See NOTE 7)

Connect with paragraph 3.a. of Details of Agreement.

These routes and points are here described by grid references, codewords, etc., and, if necessary, numbered or lettered for ease of reference in the columns below.

Movement Number or Identification Serial Number	Date	Unit/Formation	No. of Vehicles	Load Class of Heaviest Vehicles	FROM	TO	ROUTE	Route to Start Point (See NOTE 7)	Critical Points			Route from Release Point (See NOTE 7)	Re-marks
									Ref.	Due (hrs)	Clear (hrs)		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
See NOTE 5													

ANNEX B TO THE DETAILS OF AGREEMENT OF STANAG 2041 (Cont'd)

Acknowledge
Distribution
Authentication

(SECURITY CLASSIFICATION)

Notes 1. Only the minimum number of headings above should be used. Any information which is common to five or more movement numbers or identification serial numbers should be included under the 'data' paragraphs.

2. As the table may be issued to personnel concerned with control of traffic, the security aspect must be remembered. It may not be desirable to include dates or location.

3. If the table is issued by itself and not as an annex to a more detailed order, the table must be signed or authenticated in the normal way.

4. 'Critical Point' is defined as 'a selected point along a route used for reference in giving instructions. It includes start points, release points and other points along a route where interference with movement may occur or where timings are critical'.

5. This will be the number which is used to identify a column (or element of column) during the whole of the movement (see STANAG 2154, para 8 & 9).

6. In the case of an annex having the same distribution as an operation order it will not be necessary to include the headings and ending as shown on this page.

7. Definitions of these terms will be found in STANAG 2154 (para 17 and 18).

EXAMPLE OF A ROAD MOVEMENT GRAPH

DISTANCE IN KILOMETERS OR MILES (as required by authority concerned)

Designation of route:.....

(SECURITY CLASSIFICATION)

Period of time covered:.....

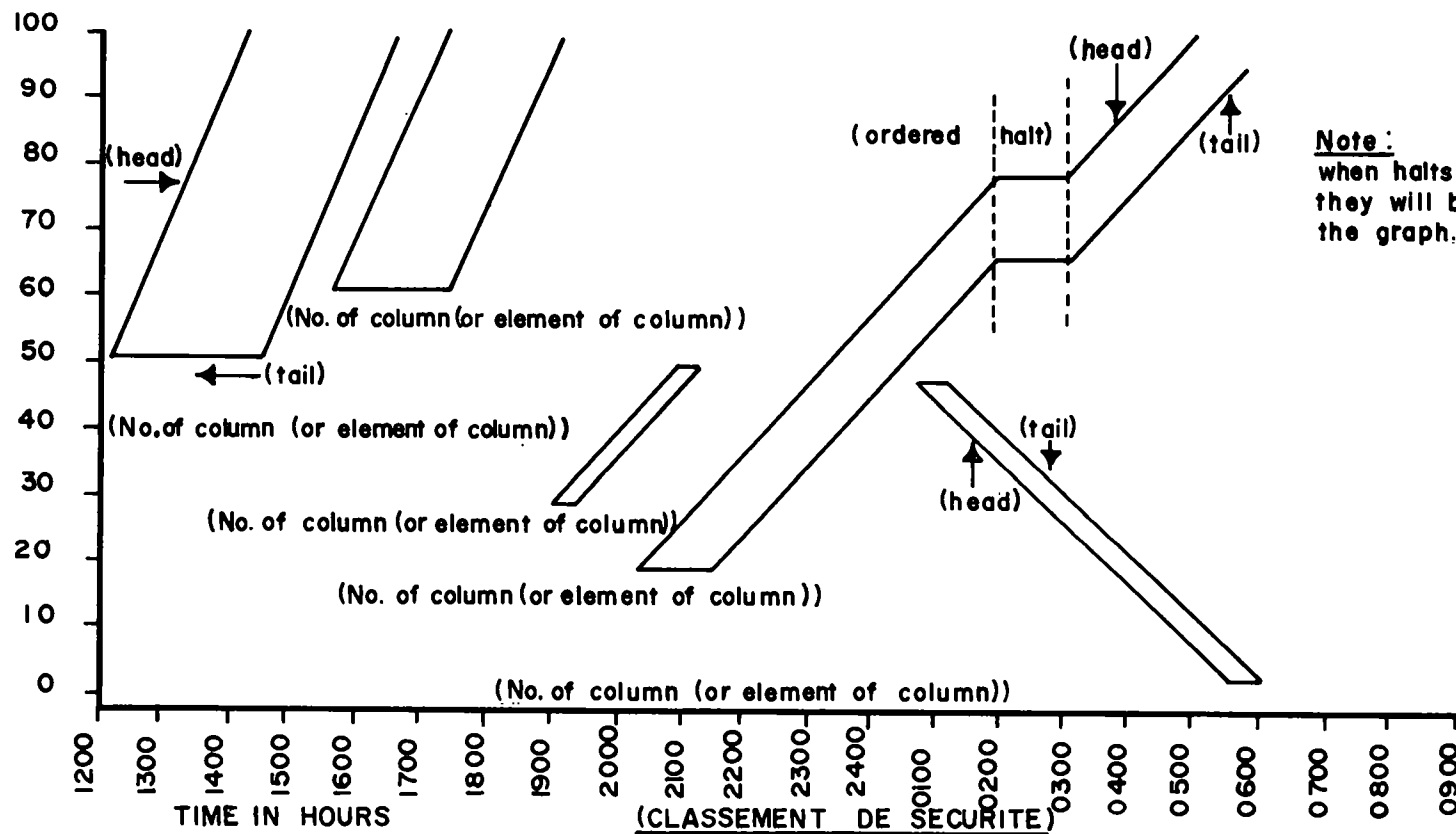


Figure H-1. Example of a Road Movement Graph



APPENDIX I

JCS PUB 3 EXTRACT

**SUGGESTED CONSTRUCTION STANDARDS FOR MILITARY CONSTRUCTION AND
BASE DEVELOPMENT IN SUPPORT OF JOINT CONTINGENCY OPERATIONS**

I-1. Definitions

The following definitions apply to the terms as used in this appendix:

a. Construction Planning Factor. The factor used in planning to determine the capacity or size of a facility.

b. Facility. An item of real property. It is the basic element of an installation.

c. Preengineered Facility. A facility for which complete construction drawings, bills of material, specifications, and instructions for fabrications and erection have been prepared.

d. Prefabricated Facility. A preengineered facility, the components of which have been manufactured and packaged at a central point, so that

construction consists mainly of assembling and uniting the standardized components.

e. Relocatable Facility. A prefabricated facility which is designed to be recovered/retrieved and reused.

f. Space Allowance. Space allowance is the area for a facility on an occupancy or strength-supported basis. The area is the space, including screened areas, corridors, partitions, and open sheds, contained within the exterior faces of the exterior walls. The area does not include the space for ramps, walkways between buildings, stair towers, utility rooms, latrines, and building equipment (heating ventilating, air conditioning, power, and plumbing fixtures) unless otherwise indicated.

I-2. SUGGESTED STANDARDS OF CONSTRUCTION FOR MILITARY CONSTRUCTION AND BASE DEVELOPMENT IN SUPPORT OF JOINT CONTINGENCY OPERATIONS

a. Where specific types of construction are listed under a standard, they are intended to be illustrative of the quality of construction. Alternatives, such as native materials or Service-developed relocatable structures, should be considered, provided they are competitive in life-cycle cost.

b. Selection of materials and construction techniques should include consideration of: the priority of the requirements, cost, climatic conditions, availability of material locally, availability and capabilities of construction agencies, impact on the local economy and construction activities, and transportation costs.

c. The life-cycle cost of a relocatable facility should include the initial procurement costs, storage costs, erection costs, and disassembly costs, as applicable, less the residual value of the components of materials recovered for reuse.

d. Any equipment or quality of construction authorized under a lower standard may be used under a higher standard.

	<i>Initial</i>	<i>Intermediate</i>	<i>Temporary</i>
Expected duration of use.....	Less than 6 months.....	6 to 24 months.....	24 to 60 months.
Applicability.....	All forces during initial deployment to a theater of operations or upon relocation to a new locale within the theater when existing facilities are not available at the new site.	Forces whose mission orientation is fixed; forces subject to relocation, provided continuous use of the facilities will be obtained through unit rotation or other means.	Forces whose mission orientation is fixed with a projected tenure of over 24 months; forces subject to relocation, provided continuous use of the facilities will be obtained through unit rotation or other means.
Specialized Construction Support.....	Cantonment clearing and grading for drainage and facility sites; grading and minimum stabilization of roads; installation of tactical bridging and relocatable port facilities; construction of tactical air-fields and other operational facilities; construction of protective revetments for POL and ammunition storage, for aircraft parking, and for command and control facilities.	Engineered site preparation, including building foundations or concrete slab floors; prefabrication of building components; supervision of building erection; construction of all-weather roads, fixed bridging and fixed port facilities; paving of airfields; installation of steel storage tanks and piping systems for POL and water supply.	Construction of all facilities.
Shelters (troop housing, mess halls, administrative buildings, etc.)	Organic equipment capable of erection by using units.	Simple wood frame structures or equivalent using local materials, austere prefabricated buildings, relocatable buildings whose lifecycle costs are comparable with the foregoing.	Building with a design life of up to 5 years; construction materials and techniques are based on a life-cycle cost comparison.
Cold Storage.....	Portable units.....	Portable units with shed.....	Buildings with a design life of up to 5 years; construction materials and techniques are based on a life-cycle cost comparison.

	<i>Initial</i>	<i>Intermediate</i>	<i>Temporary</i>
Electricity.....	Organic equipment.....	Organic or low-voltage (up to 440V) generators and distribution systems.	Central power plant; high voltage distribution.
Water.....	Organic equipment.....	Organic equipment with limited distribution to hospitals, mess halls, bath houses, and high volume users.	Central treatment plant; piped distribution.
Sewage.....	Organic equipment, pit or burnout latrines.	Organic equipment, pit or burnout latrines; waterborne to austere treatment facility for hospitals, mess halls, bath houses, and high-volume water users.	Waterborne to austere treatment facility.
Roads and hardstands.....	Stabilized with local materials.....	All-weather, with selected base course materials.	Primary roads pave; other roads and hardstands all-weather, with selected base course materials.
Bridges.....	Tactical or hasty bridging techniques....	Fixed.....	Fixed.
Airfield Pavements (See note below).....	Tactical surfacing materials.....	Paved or tactical surfacing materials.....	Paved or tactical surfacing materials.
Liquid Fuel Storage and Dispensing			
a. Terminal.....	Relocatable, nonrigid storage, and distribution.	Relocatable, rigid storage and distribution.	Fixed.
b. Forward.....	Relocatable, nonrigid storage, and distribution.	Relocatable, rigid storage and distribution.	Fixed.
Port facilities.....	Relocatable.....	Fixed or relocatable.....	Fixed or relocatable.

Note. The type of airfield surfacing to be used under intermediate or temporary standards will be based on the expected traffic cycles on the airfield. When the subgrade, as determined in TM 5-330/AFM 86-3, Vol II, requires significant improvement under tactical surfacing materials, an analysis should be made in terms of cost, time, and engineer resources for this effort vis-a-vis constructing a conventional pavement system.



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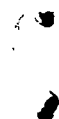
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